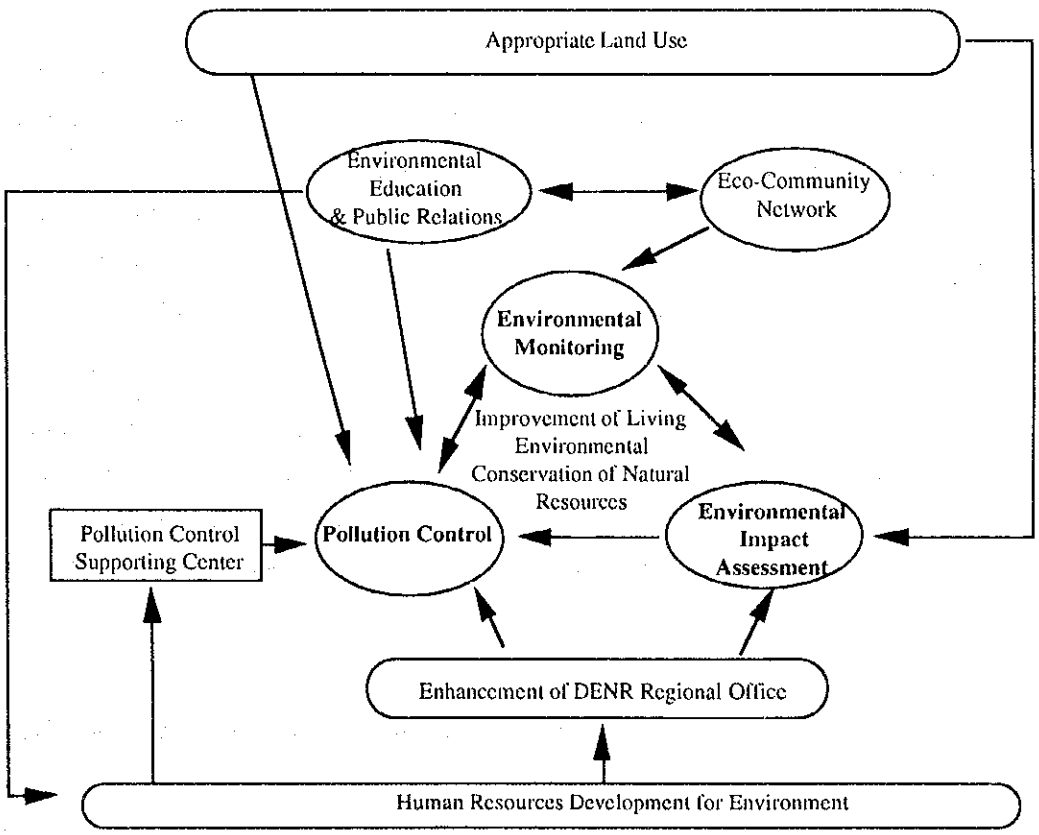
2) To provide safe, healthy and comfortable living environment for local people through community-based approach to natural resources management; and
3) To restore and preserve bio-diversity as an inherited asset of human beings and a sort of insurance against unforeseable future changes as well as part of the life support system of people and communities.

3.4.4 Strategy for environmental development

Along the directions set for environmental management (subsection 4.4.2), main environmental problems identified (subsection 4.4.1) are addressed collectively in the six areas: (1) improvement of pollution control enforcement, (2) improvement of living environment, (3) conservation and effective use of natural resources, (4) enhancement of environmental monitoring, (5) promotion of environmental awareness, and (6) strengthening of environmental administration.

Specific strategy and broad measures in each of these areas are discussed below and summarized in Table 3.4. Essential conditions of these strategy and measures are appropriate land use and human resources development. Key elements for these conditions are illustrated below as the structure of environmental management plan.



(1) Pollution control enforcement

Major pollution problems in Central Luzon are caused by effluents and emission gas from industrial plants, and household wastes and wastewater. The following are key elements for improving pollution control enforcement.

Factories relocation

The same kind of factories, especially polluting ones, would better locate in the same area. Common wastewater treatment facilities can be provided to treat effluents of the similar quality effectively. A prerequisite is the preparation of land use plans by municipality. Municipal land use plans should be integrated by province to avoid residential areas of one municipality to locate next to industrial areas of a neighbouring municipality.

Enforcement of penalties

DENR imposes penalties on violators of environmental laws and regulations, not exceeding P5,000 per day during a violation period. However, DENR faces difficulties in detecting violators due to lack of monitoring system, inadequate expertise, and insufficient human resources, funds and equipment. Collected penalties should better be used directly for improving monitoring and enforcement, rather than paid to the National Treasury through DENR as is presently the case.

Supporting SMEs

Small and medium size enterprises find it difficult to install pollution control facilities due to high initial costs and difficult and costly operation. A Pollution Control Cooperation Fund may be established to support SMEs. The Fund would support the provision of technical assistance to SMEs in planning and design of pollution control facilities, training for pollution control management, and training for monitoring of effluent and emission gas. The Fund would also provide concessional loans for the installation of pollution control facilities.

EIA

Implementation of an environmental impact assessment (EIA) suffers from lack of human resources, weak enforcement of penalties against the lack of environmental compliance certificates (ECC), and lack of knowledge of the EIA system on the part of industries and communities. Stiffer penalties for the violations of ECC and dissemination of information on the EIA system are necessary.

Development of human resources

DENR or DTI should train candidates for Pollution Control Officers required for private establishments by a DENR Administrative Order.

(2) Living environment

Improving living environment in urban areas is increasingly more important as the urbanization proceeds rapidly in Central Luzon. It is desirable to provide urban infrastructure in anticipation of future urbanization based on appropriate land use plans. To realize this effectively under financial constraints, guidelines need to be established to prioritize the provision of urban infrastructure in a step-wise manner. For solid waste systems, the following is in order.

Improvement of solid waste systems

A solid waste management system consists of collection and haulage, treatment and disposal. Service coverage of collection needs to be established for different classes of urban centers. For treatment, incineration is not recommendable for Central Luzon since calorific value of wastes is low, and operation and maintenance are technically difficult and costly. Recycling should be encouraged.

For disposal, selective and step-wise introduction of sanitary landfill is recommended. For this, three levels of landfill may be defined as follows.

Operation	Level A	Level B	Level C
Embankment	x	x	x
Soil cover	x	x	
Lining	x		
Leachate treatment	x		
Gas ventilation	x		

Service coverage and landfill levels should be defined for different urban centers, depending on their characteristics. The following provide just a possible way.

Characteristics of municipalities	Service coverage for collection	Disposal Level
Rapid urbanization	Urbanized area	A
Restrained urbanization	Urbanized area	B
Potential urbanization	Urbanized area and suburbs	B
Slow urbanization	Urbanized area	C
Minimal urbanization	Town proper	C

To give incentives for better solid waste management, DENR-III may establish the Best Solid Waste Management Award, which would be given to several municipalities a year. Also, a solid waste management training center should be established to train local government staff.

(3) Natural resources

Conservation and effective use of natural resources involve (1) designation and establishment of conservation areas, (2) conservation activities, (3) establishment of management system for appropriate and effective use of natural resources, and (4) monitoring of conservation areas and natural resources use. A key criterion for both conservation and use is to restore and preserve bio-diversity. For instance, reforestation as a conservation activity should be conducted to establish an appropriate mix of vegetation rather than single tree species. Use of natural resources, similarly should not deplete any original elements constituting the resources base. Community-based approaches should be effected for management of natural resources.

(4) Environmental monitoring

Strengthening monitoring capacity

Monitoring capacity of DENR-III should be strengthened. A Regional Environmental Monitoring Center may be established under DENR-III, their staff trained and an environmental data base established.

Training for environmental monitoring

The existing Training Center for Forest Conservation in Nueva Ecija, under DENR, should be restructured. In addition to existing courses on reforestation planning, watershed management (or soil erosion control), and social forestry, a new course should be offered on environmental monitoring. Pollution Control Officers of the private sector may also be trained at the center.

Monitoring of water and air quality

Monitoring needs in Central Luzon are extensive for both water and air quality. To allow efficient and timely monitoring, proper methods of analysis should be established, consisting of precise analysis and summary analysis. These methods are combined to identify more serious problems at smaller costs. Methods of monitoring are proposed in Table 3.5, covering water and air quality, natural resources or ecosystem, and land use.

(5) Environmental awareness

Environmental public relations

Various information related to environment needs to be conveyed among communities, government agencies and the industrial sector. Effective means of communication vary depending on the kind of information and entities involved. Appropriate public relations means are indicated in Table 3.6 for different target levels. Face to face communications and seminar/workshop are effective for people/community levels. For a wider communication,

radio may be most effective as 70% of households in Central Luzon already own radios. A mobile communication system with TV and video would offer another effective tool for government agencies to disseminate various messages.

Environmental education

Central Luzon has three major assets for environmental education. Two of them are natural resources: the Candaba swamp and the Subic rainforest. Third is the presence of native upland people, Aetas, who have extensive knowledge and experiences on resource use and survival in forest areas. Additional resources include the Subic bay and Zambales coasts with well preserved coral reefs and marine environment, Mt. Pinatubo and its influence areas, and even traditional craftmanship that makes effective use of natural resources to enrich living environment.

These resources make Central Luzon an ideal location as a center for environmental education. A World University of Environment may be established. Also, eco-tourism should be promoted as a tool for environmental education.

Eco-community network

To facilitate the communication between communities, government agencies, and the industrial sector, an Eco-Community Network should be established by the DENR-III initiative. The structure of the network and information to be conveyed between the entities involved are shown in Figure 3.6.

(6) Environmental administration

Environmental administration needs to be strengthened at the regional and the local levels. Particularly for monitoring, capacity of provincial governments should be increased by training of staff for monitoring techniques. Development of human resources is important at all the levels, and in particular the number of environmental specialists should be increased at PENROs and CENROs. Also important are to improve mobility and communication at the field level, to strengthen policy formation and planning for field operation, to upgrade in-service training and skills, and to promote environmental awareness offices. Environment should be integrated into planning, monitoring and evaluation processes of all development activities.

Table 3.4 Environmental Strategy for Central Luzon (1/2)

Classification	Measures	Strategies
A. Enhancement of Pollution Control	o to designate appropriate place for new industries o to strengthen control and monitoring of effluents and gas emissions o to support technically and financially small and medium size industries o to enforce implementation of EIA o to develop human resources of the private sector such as a Pollution Control Officer	o Transfer of appropriate sites for factories removal o Enforcement of penalty o Establishment of Pollution Control Support Organization for Small and Medium Size Industries o Enhancement of EIA o Enhancement of Environmental Monitoring o Formulation of Eco-Community Networks o Formulation of Land Use Plan o Improvement of Solid Waste Management System o Promotion of Environmental Education and Public Relations o Enhancement of DENR Regional Office
B. Improvement of Living Environment	o to develop appropriate urban management o to implement appropriate land use o to enhance pollution control o to improve and manage traffic o to introduce appropriate solid waste management	o Enhancement of Environmental Monitoring o Formulation of Eco-Community Networks o Formulation of Land Use Plan o Improvement of Solid Waste Management System o Promotion of Environment Education and Public Relations o Enhancement of DENR Regional Office o Formulation of Natural Disaster Measures o Promotion on Preventive Measures of Natural Disaster
C. Conservation and Effective Use of Natural Resources	o to conserve ecosystem o to conserve and restore natural resources o to promote appropriate and efficient natural resources use o to monitor natural resources	o Enhancement of Environmental Monitoring o Formulation of Land Use Plan o Promotion of Environmental Education and Public Relations o Enhancement of DENR Regional Office o Formulation of Natural Disaster Measures o Promotion on Preventive Measures of Natural Disaster

Table 3.4 Environmental Strategy for Central Luzon (2/2)

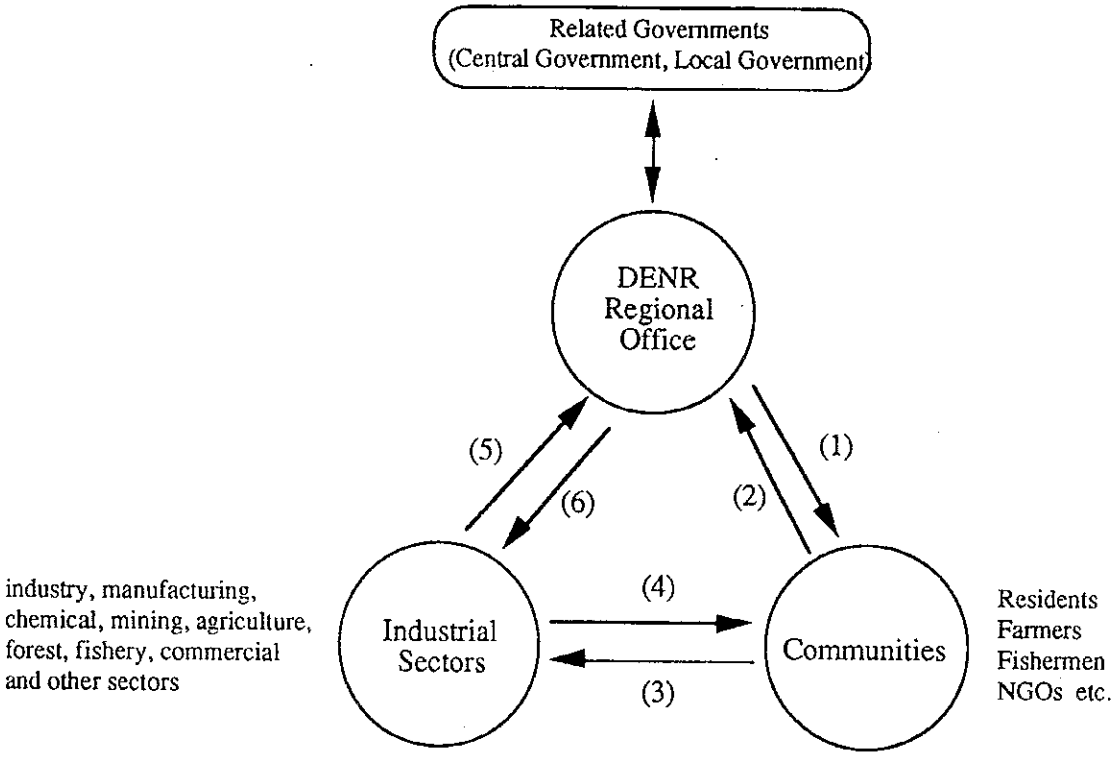
Classification	Measures	Strategies
D. Implementation of Environmental Monitoring	o to enhance monitoring of effluent and gas emission from factories o to monitor use of natural resources o to introduce simple and cost effective environmental monitoring system for water quality and air quality o to improve DENR Regional Office's Laboratory o to develop human resources for environmental monitoring	o Enhancement of Environmental Monitoring o Restructuring "RP-Japan Training Center" for Human Resources Development o Formulation of Eco-Community Networks
E. Promotion of Environmental Awareness	o to strengthen environmental awareness of communities o to strengthen citizen's participation o to promote environmental education o to have common environmental information and issues o to disseminate environmental information such as preventive measures of pollution at community level o to ensure regular flow of environmental information from community level to local government o to establish a community-based resource information system	o Formulation of Eco-Community Networks o Promotion of Environmental Education and Public Relations
F. Enhancement of Administration	o to improve environmental administration and management for Regional and Provincial level o to improve environmental monitoring techniques and capacity of Regional and Provincial governments o to improve mobility and communication at the field level o to develop human resources of environmental specialists for Regional and Provincial governments o to control appropriate land use o to systematically strengthen policy formation and planning of field operation o to upgrade in-service training and skills	o Promotion of Environmental Education and Public Relations o Enhancement of DENR Regional Office o Human Resources Development for Environment

Table 3.5 Proposed Environmental Monitoring Plan for Central Luzon

Targets	Elements	Indicators	Method	Frequency	Implementation Agencies
Water Quality	Surface water quality	Basic Indicator water temperature, Cl-, pH, DO, COD, BOD, SS Nitrate, Nitrite, Phospate, colibacillus	field survey	4~6 times/year	DENR/Provincial Government
		Other Indicators of DENR AO No. 34		1~4 times/year	
	Effluent	refer to DENR AO No. 35	sampling from discharge pipe	based on regulations	Private Sectors (Pollution Control Officer)
Air Quality	Ambient air quality	Basic Indicator CO, NOx, SO2, SPM	field survey	1~6 times/year	DENR/Provincial Government
		Other Indicators of DENR AO No. 14			
	Emission gas from factories	refer to DENR AO No. 14	sampling from stack	based on regulations	Private Sectors (Pollution Control Officer)
Natural Resources	Vegetation	coverage area	field survey/remote sensing	1 time/year	DENR
	Inventory of fauna and flora	species	field survey	1 time/year	DENR
	Invaluable fauna and flora	species/habitat	field survey	1 time/year	DENR
	Soil erosion	area/location	field survey/remote sensing	1 time/year	DENR
Land Use	Land use	coverage area by use	field survey/remote sensing	1 time/year	Monitoring-DENR Control-Related Agencies

Table 3.6 Proposed Public Relations Tools for Environmental Information

Targets / PR tools	Provincial Level	Municipality Level	Barangay Level	Community Level	Individual Level	NGO's	Industrial Sector	Agriculture/ Fishery Sectors
TV	X							
Radio	X	X					X	X
Newspaper	X						X	
Newsletter	X	X	X	X		X	X	X
Pamphlet	X	X	X				X	X
Poster	X	X	X	X			X	
Video	X	X	X	X			X	X
Seminar/Workshop	X	X	X			X	X	X
Events	X	X	X	X		X	X	X
Bulletin Board			X	X	X			X
Face to face			X	X	X			X



(1) Government to Communities
- to provide environmental information
- to promote environmental education
- to conduct training and seminars

(2) Communities to Government
- to give suggestions/ideas/opinions/ on how to improve their environment
- to report illegal activities (environmental problems) by citizen watch
- to participate in planning and decision-making about project
- to cooperate/participate in Government programs

(3) Communities to Industrial Sectors
- to actively participate with the environmental project/program
- to accuse/complain illegal activities (environmental problems)by citizen watch

(4) Industrial Sectors to Communities
- to initiate environmental project/program (tree plantation, distribution of waste receptables, clean up river, etc.)
- to provide information of pollution abatement

(5) Industrial Sectors to Government
- to report operation and pollution control
- to conduct dialogues with government regarding their problems

(6) Government to Industrial Sectors
- to provide pollution control information
- to promote environmental education
- to conduct training and seminars
- to control operation of factories in compliance with regulations

Figure 3.6 Structure of Eco-Community Network

CHAPTER 4

CHAPTER IV DEVELOPMENT SCENARIOS AND FRAMEWORKS

4.1 Spatial Frameworks

4.1.1 Land suitability and alternative land use plans

(1) Land potential

Land management units

Land management units (LMUs) are the operational resources units that represent the functional management subdivisions of land types in each defined pedo-ecological zone. Each LMU is identified for its distinct and recurring land management-related properties such as land use, drainage, soil texture, soil depth, elevation, flooding and erosion hazards.

The soil resources of Central Luzon are divided into three broad groups according to origin and formation: viz. alluvial soil of the flood plain and related areas, volcanic soil of the piedmont and upland areas and residual soil derived from sedimentary rocks in the mountains and upland areas. The broad landforms of Central Luzon are classified by several parameters like soil type, texture, column depth, drainage and flooding for hills and mountains. Seven major landforms are identified - coastal or littoral, broad alluvial plains, minor alluvial plains, residual soils, hills, mountains and miscellaneous. Table 4.1 summarizes the LMUs in Central Luzon.

Lahar and flood prone areas

As of 1993, the total area of 52,320 ha or 2.9% of the Central Luzon land was covered by lahar. Of this, 24,791 ha or 47% occur in the warm lowland, corresponding to 3.4% of the total area in this LMU category.

Additional 47,625 ha have been determined to be lahar hazard prone. The combined area of lahar covered and lahar hazard prone lands corresponds to 5.6% of the total land in Central Luzon. Moreover, 35,055 ha have been identified as siltation and flooding prone. The distribution of these areas are summarized by province in Table 4.2, and illustrated in Figure 4.1.

Land use limitation

A little over one third of the total area of Central Luzon has no physical limitation. Large part of these areas are located in Pampanga (56.4%), Bulacan (55.2%) and Bataan (53.2%). About 9.0% of the total area of Central Luzon has very steep slope, 14.3% is prone to moderate or severe erosion, 13.9% is prone to poor drainage, while another 8.4% is subject to flooding and poor drainage.

(2) Land suitability for crop cultivation

The Bureau of Soil and Water Management (BSWM) has analyzed and classified the LMUs into five suitability classes for eleven groups of crops following the FAO methodology and guidelines for crop suitability analysis. For purposes of the Study, the eleven crop groups were regrouped into eight: lowland paddy, grains, vegetables, industrial crops, managed pasture/agro-forestry, tree crops and fishponds. The five suitability classes were simplified into three: good land potential, moderate to marginal land potential, and no potential or not relevant.

The LMUs were classified by using a GIS into these three suitability classes for each of the eight crop groups. It has been found out that Central Luzon has very good potential for a very wide range of crops in both the lowland and upland pedo-ecological zones.

(3) Land use plans for alternative scenarios

A land use plan has been prepared for each of the three alternative development scenarios. Basic concepts of each scenario have been interpreted into specific crops and livestock/poultry activities to be emphasized as summarized in Table 4.3. Correspondence between pedo-ecological zones, existing and potential land use and proposed land use is illustrated in Figure 4.2. Proposed land use plans for the three scenarios prepared by a GIS are presented in Figures 4.3, 4.4 and 4.5.

Characteristics of alternative land use plans

The proposed land use under the Localization largely maintains the existing land use pattern. Main differences are : (1) rain-fed paddy areas in lowland will be converted to mixed farming, and (2) upland areas will be used for multi-storey farming. Also agro-forestry will be introduced in areas designated as the production forest.

Under the Globalization, the entire lowland, except areas for irrigated paddy, will be devoted to commercial crops. Upland areas will be used partly for managed pasture as well as multi-storey farming. Tree crops will be established in the production forest area.

The land use proposed for the Glocalization will realize the balanced use of lowland for irrigated paddy, mixed farming, commercial crops and other diversified crops. Upland areas will be used for multi-storey farming and managed pasture. In the production forest area, agro-forestry and tree crops will be established.

Common features

The three alternative land use plans have the following common features.

(a) Lowland prime irrigated paddy cultivation areas occupy 281,000 ha. These areas match existing land use. Increasing the cropping intensity and yield are the main objectives of land management for areas under this category. Nueva Ecija (145,000 ha), Tarlac (55,000 ha), Pampanga (31,000 ha) and Bulacan (38,000 ha) have large areas under irrigated paddy cultivation.

(b) Diversified upland crops and tree crops in prime upland areas cover 96,000 ha for multi-storey farming. Existing land use is mostly grasslands/shrublands. Nueva Ecija (22,000 ha), Tarlac (34,000 ha) and Bataan (18,000 ha) have significant area under this category.

(c) The remaining upland area of 85,000 ha is planned for managed pasture (prime suitability) and/or agroforestry and agro-industrial crops (moderate to marginal suitability). A part of this land use category is also determined suitable for future urban/industrial needs. The existing land use in these areas is grasslands/shrublands. These areas are large in Tarlac (17,000 ha), Bulacan (33,000 ha) and Bataan (18,000 ha).

(d) Large area of 223,000 ha in Production Forest area is moderately to marginally suitable for tree crops and/or agroforestry. Existing land use is secondary residual forest or grasslands/shrublands. Zambales has very large area under this category (129,000 ha) followed by Tarlac (33,000 ha) and Nueva Ecija (21,000 ha).

Differences between scenarios

The proposed land use plans differ between the scenarios mainly in the following areas.

(a) Rainfed mixed farming area is 199,000 ha (93,000 ha in Nueva Ecija; 28,000 ha in Zambales; 33,000 ha in Pampanga; 33,000 ha in Bulacan) in the Localization scenario (rice or corn mixed with vegetables and pulses). This entire area is diverted to commercial/industrial crops in the Globalization scenario. In the Glocalization scenario, about 117,000 ha (Nueva Ecija - 49,000 ha; Zambales 27,000 ha; Pampanga - 22,000 ha) are classified under mixed farming (mostly corn with vegetables and pulses). The existing land use in these areas is rainfed paddy or grasslands/shrublands.

(b) Rainfed diversified crops are to be cultivated in 65,000 ha in Localization and Glocalization. These areas are mostly located in Tarlac (28,000 ha) and Pampanga (28,000 ha). In case of Globalization, this entire area is diverted to cultivation of selective commercial/industrial crops. These areas are presently under cultivation to a wide variety of crops including corn, sugarcane, vegetable crops, tree crops and industrial crops. Cropping intensity increase along with yield increase are the main objectives of these areas in Localization and Glocalization. Crop diversification to commercial crops becomes the objective of these areas in case of Globalization.

(c) The area for diversified commercial crops and tree crops is the largest in case of Globalization at 265,000 ha (Nueva Ecija 99,000 ha; Tarlac 35,000 ha; Zambales 30,000 ha; Pampanga 61,000 ha; Bulacan 33,000 ha). This is 82,000 ha in Glocalization (43,000 ha in Nueva Ecija, 22,000 ha in Bulacan and 11,000 ha in Pampanga). There is no cultivable area under this crop category in case of Localization. Existing land use in these areas is non-irrigated or rainfed paddy or grasslands/shrublands. As such, crop diversification with increased cropping intensity and yield increases are the objectives under all scenarios for land area under this category.

(4) Potential urban/industrial lands

Potential urban and industrial lands have been identified by using a GIS. They are defined as follows:

1) areas of slope less than 8% (lowland) and/or slope less than 18% (lowland and upland),
2) areas having accessibility within 15 km from major urban centers, within 7.5 km from secondary urban centers, within 4 km along major highways, or within 2 km along secondary highways,
3) non-prime agricultural lands not susceptible to severe flooding and not within vulnerable coastal areas, and
4) areas not covered by lahar or prone to lahar hazard or siltation threat.

Existing built-up areas and industrial areas were excluded from the analysis. The identified potential urban and industrial lands are distributed in the region as shown in Figure 4.6. The potential areas by province are summarized in Table 4.4. The total potential urban and industrial area is 37,272 ha, consisting of 5,390 ha in lowland and 31,881 ha in upland. This corresponds to 56% of the existing urban and industrial areas.

4.1.2 Water endowments and demand-supply balance

(1) Water resource endowments

Rainfall patterns

Rainfall patterns in Central Luzon are affected by northeast monsoons bringing frequent rains to the east coast and southwest monsoons responsible for the rainy season. Heavy precipitation occurs generally from May to November, the period of southwest monsoons. More than 90% of the annual rainfall concentrates in this period with August experiencing the heaviest downpour. The annual rainfall ranges from 1800 mm in the central portion of Central Luzon to over 3,000 mm along the eastern and the western coasts (Figure 4.7).

Basin system

The Pampanga river basin with the drainage area of 9759 km^2 occupies the eastern half of Central Luzon. It originates from the Caraballo mountains constituting the northern boundary of Central Luzon, flows generally to the south and drains in Manila Bay. Stream gradients are steep along upper reaches but become flatter as the river passes progressively through a rich agricultural land, extensive swamp lands, and finally coastal lands with commercial fish ponds where the main channel changes into a network of sluggish tidal streams. In the middle reaches, there exist two swamps: Candaba swamp with 250 km^2 between the Angat and the Pampanga rivers and San Antonio swamp with 120 km^2 between the Rio Chico and the Pampanga rivers.

Principal tributaries of the Pampanga river include the Angat, Penaranda, Coronel, Digmala and Pantabangan rivers on the east side of the main stream and the Rio Chico, Talavera and Carrangalan rivers on the west side. The Angat rivers drains the southeastern portion of the basin and joins the Pampanga river at a point 20 km from Manila Bay.

There are only a few other rivers with drainage areas larger than 500 km^2. The Tarlac river is the major tributary of the Agno river flowing from the northern region and draining in the Lingayen gulf after joined by the Tarlac river. The O'Donnel and the Camiling rivers are tributaries of the Tarlac river. Other rivers include the Bucac, Pantawan, Sto. Tomas, Anonang and Lawis rivers in Zambales, the Pasig Potrero, Porac, Gumain, Caulaman and Colo rivers in Pampanga, and the Pilar river with the largest basin in Bataan (Table 4.5, Figure 4.8).

Groundwater

Groundwater is widely used in Central Luzon through both shallow and deep wells. Groundwater data are available in the "Rapid Assessment of Water Supply" published in 1992 by the National Water Resources Council (NWRC) and also in well records from NIA and LWUA. Generally, the central plain is good for shallow wells, and the mountain areas in the east and the west are difficult areas for groundwater utilization (Figure 4.9, Table 4.6).

Deep well areas are found generally in transitional areas between the mountains and the central plain. In particular, a large deep well area extends along the lower foothills of the Sierra Madre mountains and the eastern margin of the central plain, where limestone beds out-crop. Another large deep well area is located in the northern part of Tarlac at the foot of the Zambales mountains.

(2) Future water demand

Future water demand in Central Luzon is projected by municipality and for domestic, industrial and irrigation uses. Domestic water demand is projected based on the projected

population by municipality (subsection 4.2.3) and assumed unit water use. The unit per capita water use in 2010 is assumed to be 150 l/day in urban areas and 60 l/day in rural areas. Service coverage of public water supply is assumed as follows.

Service coverage of Public Water Supply

(Unit: %)

Province	1990		2010	
	Urban	Rural	Urban	Rural
Bataan	61	36	98	94
Bulacan	51	42	98	94
Nueva Ecija	77	52	100	100
Pampanga	69	42	98	94
Tarlac	88	66	100	100
Zambales	n.a	n.a	98*	94*

* : Assumed by the JICA Study Team

Source : DPWH, Water Supply, Sewerage and Sanitation Development Plan, May 1991.

For industrial water demand, the unit water use is assumed at 1,200 l/day per establishment, slightly reduced from 1,300 l/day established in the 1981 LWUA Study. This rate is multiplied by the number of industrial establishments in 2010, projected from the number of industrial establishments in 1990 by applying the ratio between industrial value-added in 1990 and 2010.

For irrigation water demand, the unit consumption is assumed at 1,300 mm/year in 2010. This is applied to the projected irrigation area derived by municipality using a GIS.

The projected water demand is summarized by province and compared with the estimated consumption in 1990 in Table 4.7. Numbers are only indicative and for the purposes of comparison and qualitative analysis. The irrigation water demand would practically the same in 2010 as in 1990, and constitute by far the largest portion of the total demand. The industrial water demand would increase at the highest rates, but would still be smaller than the domestic water demand in 2010. The latter, however, would depend on expansion of service coverage as assumed. The irrigation water demand in 2010 would be the largest in Nueva Ecija, followed by Tarlac, Pampanga and Bulacan. The industrial water demand in 2010 would be the largest in Bulacan, followed by Nueva Ecija and Bataan.

(3) Water balance

Water balance is worked out for two cases. First, the projected irrigation demand in 2010 is compared with the surface water availability during a critical year. The surface water availability during the critical year is taken to be 60% of the average annual availability. Second, the projected domestic and industrial water demand is compared with the groundwater potential. Results are illustrated in Figures 4.10 and 4.11.

Serious deficits of irrigation water are observed in the upper catchment areas of the Pampanga river, mainly in Nueva Ecija, and also on the left bank of the lower reaches of the Pampanga river. Some deficits of domestic and industrial water are observed in several municipalities in Bulacan, San Fernando and Mariveles.

Observed occurrence of a deficit of irrigation water in any municipality does not immediately mean the deficit will occur within the municipality. It may be served from the upstream by irrigation systems. Deficits observed in several municipalities in the same broad area, however, indicate the presence of future problems.

Some municipalities are served by surface water for their public water supply. Observed deficits of domestic and industrial water imply that those municipalities would have to depend more on surface water.

4.1.3 Urban centers and artery network

Spatial development of any region is affected by a network of transportation arteries and distribution of urban centers as well as resource potentials and constraints. In Central Luzon, three broad areas are identified for accelerated urbanization based on the existing distribution of urban population and infrastructure facilities. They are called the National Triad Growth Centers. In relation to these, more important urban centers are identified and hierarchical structure of urban centers proposed to provide various urban services effectively throughout the region. In line with the proposed urban hierarchy, a network of transportation arteries is conceived linking those urban centers in higher tiers.

(1) National Triad Growth Centers

As clarified in sub-section 2.1.1, the urbanization pattern in Central Luzon is more concentrated. The three broad areas of urban population concentration are defined as follows.

Subic Bay Metropolitan Area

This area covers Olongapo City, Zambales where the Subic Bay Metropolitan Authority has its headquarters and its neighboring areas. Special economic zones may be expanded to Dinalupihan, Hermosa and Morong, Bataan as well as Subic, Zambales. The combined population of these municipalities and the City was 350,000 in 1990 of which 312,000 or 89% was urban.

San Fernando - Angeles Metropolitan Area

This area extends along the Manila North road and Northern Luzon expressway from San Fernando, through Angeles City to Mabalacat. The neighbouring municipalities of St.

Tomas, Mexico and Bacolor may also be included. The combined population of these municipalities and the City was 686,000 in 1990, of which 620,000 or 90% was urban.

Bulacan Conurbation

This is the area in Bulacan directly affected by the spill-over from Metro Manila. It includes 15 municipalities along main highways radiating from Metro Manila, but those in the eastern mountainous area and the fishery municipality of Hagonoy are not included. The total population was 1,013,000 in 1990, of which 923,000 or 91% was urban.

(2) Hierarchical structure of urban centers

Urban centers are classified with respect to delivery capacity and effectiveness of various urban services. Determining factors include (1) existing accumulation of urban population, (2) existing accumulation of various economic activities, (3) present and expected administrative and other specialized functions, (4) resource potentials and constraints, and (5) location in relation to arteries, other urban centers and other specialized facilities.

A hierarchical structure of urban centers in Central Luzon has been analyzed based on the present distribution of population and urban centers, distribution of manufacturing and service establishments, land capability, existing infrastructure and urban facilities. A proposed urban hierarchy is shown in Figure 4.12.

Regional Center

San Fernando is the Regional Center strategically located in relation to other provincial capitals and within the National Triad Growth Centers. In addition to administrative functions with regional and provincial offices, a variety of industrial and service activities are accumulating. Population growth was among the highest at 3.6% per annum during 1980 - 90 of all the municipalities and Cities. In terms of population alone, it is qualified as a Regional Center with the 1990 population of 158,000.

Subic-Regional Centers

Considering the spatial extent of Central Luzon, three Sub-Regional Centers may be designated. Cabanatuan City with the 1990 population of 173,000, Olongapo City with 193,000 and Malolos with 125,000 are all qualified with over 100,000 population. Malolos has been selected due to its dominant commercial and administrative functions, at present and expected. Olongapo City is expected to serve the western part of Central Luzon as an industrial, trade and tourism center. Cabanatuan City may be a primary trade center situated at a strategic point between the Northern Luzon and Metro Manila, and serve the Northeastern part of Central Luzon with multiple functions. The latter include higher education as the City has two universities, five colleges and 12 high schools.

Major Urban Centers

Eleven Major Urban Centers may be designated to extend main urban services coverage to the entire region. These centers are Palayan City, San Jose City and Gapan in Nueva Ecija, Tarlac, Mecauayan and Baliuag in Bulacan, Angeles City, Dinalupihan, Balanga and Mariveles in Bataan, and Iba, Zambales. All of those centers are expected to have population in 2010 exceeding the qualification threshold of 80,000 except Palayan City and Iba. The latter are qualified for their administrative functions.

These are medium sized multi-functional urban centers with functions of sub-regional business/service center, sub-regional education center and industrial area. These centers, are also equipped with some specialized functions, depending on locational and resource characteristics. These centers and their specialized functions are summarized in Table 4.8.

Service Urban Centers

Under the Major Urban Centers, 23 Service Urban Centers may be designated: six in Nueva Ecija, five in Tarlac, one in Bulacan, four in Zambales. These centers serve rural hinterlands with distribution functions of agricultural input and output, agricultural support facilities, agro-processing and social services delivery functions.

Rural Centers

Further down the tier are Rural Centers, which provide basic urban services to their rural neighborhood with a town hall, schools and local markets. All the remaining municipality capitals fall in this category. The hierarchical structure of urban centers in Central Luzon is given in Figure 4.13.

(3) Artery network

A future artery network for Central Luzon is proposed in line with the National Triad Growth Centers and the proposed hierarchical structure of urban centers. It consists of inter-regional arteries and intra-regional arteries linking those urban centers in the upper tiers. Figure 4.14.

Inter-regional arteries

Inter-regional arteries for Central Luzon are basically north-south roads linking the northern regions to Metro Manila through Central Luzon. The main artery will continue to be the Manila North Road passing through Bulacan, Pampanga and Tarlac and the North Luzon Expressway with its extension. It has a secondary artery branching off at Tarlac and leading to the Lingayen gulf area in Pangasinan.

The alternative artery is provided by the Maharlika highway leading from Metro Manila, through Bulacan and Nueva Ecija, to the Cagayan Valley. In view of limited capacity and right-of-way acquisition problems associated with this highway, a new inter-regional artery is

conceived with the alignment to the east of the Maharlika highway as a medium to long term option. This alignment has two potential advantages. It may contribute to opening up the Cagayan Valley and Aurora Province, and provide an alternative link with the Metro Manila urban transport system. Other inter-regional links are from Nueva Ecija to the Dingalan bay area in Aurora and from Zambales to Pangasinan along the coast.

Intra-regional arteries

Intra-regional arteries for Central Luzon are main roads connecting those urban centers in the upper tiers of proposed hierarchy. They are mostly existing roads to be improved or upgraded such as Olongapo City-Iba, Gapan-San Fernando-Dinalupihan, and Dinalupihan-Balanga-Mariveles links. The Iba-Tarlac link is new.

A new structure of intra-regional arteries is proposed to strengthen links between key urban centers to support the CLDP paradigm. It consists of a new highway leading from the Subic bay area, through Angeles City, Capaz and La Paz in Tarlac and Cabanatuan City, to Palayan City in Nueva Ecija, a more direct link between Malolos in Bulacan and Olongapo City, and strengthened link from Malolos through San Fernando to Angeles City.

This structure should be fully established in a medium term. In view of high costs involved in extensive viaduct sections of the Malolos-Dinalupihan and the Dinalupihan-Angeles City links, however, improvement of the San Fernando-Dinalupihan road may provide a short-term alternative to both of the links.

The new intra-regional highway called here the Rainbow highway links effectively five provinces except Bulacan and four cities except San Jose City directly as illustrated in Figure 4.14. This highway would help to direct flow of goods and movement of people away from Metro Manila by creating self-sustaining and evolving sphere of economic development within Central Luzon.

Table 4.1 Land Management Units in Central Luzon

LMU	N. Ecija	Tarlac	Zambales	Pampanga	Bulacan	Bataan	Central Luzon
Warm Lowland (<8% slope,<100 m elevation, >25C)	265,331	118,885	73,956	146,251	98,062	23,146	725,632
Warm Cool Upland (<18% slope,100-500 m elevation, 22.5 -25 C or 8-18% slope, <100 m elevation and >25 C)	76,605	72,498	21,078	18,445	49,673	42,812	281,112
Warm Cool Hilly land (>18% slope, <500 m elevation,>22.5 C)	83,852	48,743	152,608	8,084	49,845	43,090	386,221
Cool Highland (>500 m elevation, <22.5 C)	68,876	39,481	94,746	9,052	38,892	16,396	267,443
Miscellaneous	43,219	23,838	22,914	18,511	28,459	3,363	140,304
TOTAL	**537,883**	**303,445**	**365,302**	**200,343**	**264,931**	**128,807**	**1,800,712**

Source: GIS database for the JICA Study

Table 4.2 Land Area Covered by Lahar, Prone to Lahar Deposit and Prone to Siltation in Land Management Units

CODE	N. Ecija			Tarlac			Zambales			Pampanga			Bulacan			Bataan			Central Luzon		
	LA	LP	SP	LA	LP	SP	LA	LP	SP	LA	LP	SP	LA	LP	SP	LA	LP	SP	LA	LP	SP
Warm Lowland	41	2,054	4,405	6,660	18,410	74	6,686	10032	8577	11181	8633	16597	0	0	153	223	16	281	24,791	39,145	30,087
Warm Cool Upland	0	0	0	1,261	1,474	0	106	15	0	1156	75	9	0	0	0	0	0	0	2,523	1,564	9
Warm Cool Hilly land	0	0	0	585	377	0	6293	1352	1097	644	0	0	0	0	0	0	0	0	7,522	1,729	1,097
Cool Highland	0	0	0	338	4	0	6,357	0	0	1429	0	0	0	0	0	0	0	0	8,124	4	0
Miscellaneous	0	0	252	2,706	1,366	100	4,522	2720	1487	2131	1096	2024	0	0	0	0	0	0	9,359	5,182	3,863
TOTAL	41	2,054	4,657	11,550	21,631	174	23,964	14,119	11,161	16,541	9,804	18,630	0	0	153	223	16	281	52,319	47,624	35,056

LA: Lahar affected
LP: Lahar prone
SP: Siltation prone

Source: GIS database for the JICA Study

Table 4.3 Agricultural Development under Alternative Scenarios

	LOCALIZATION	GLOBALIZATION	GLOCALIZATION
PADDY	Maximum production by using all the potential paddy area (irrigated and non-irrigated)	Self sufficiency by yield increase with minimal area	Maintaining some export margin
OTHER CROPS	Vegetables and pulses for local market under mixed farming; corn and other crops for upland crop area	Specialization in a few commercial crops mainly for export markets	Vegetables, pulses and corn under mixed farming with paddy; few commercial crops; coffee, cashew and fruits in combination with vegetables and pulses under multi-storey farming
LIVESTOCK AND POULTRY	Backyard livestock and poultry with local feed	Commercial scale livestock and poultry with artificial feed	Organized livestock and poultry with managed pasture for livestock and local feed

Table 4.4 Existing and Potential Urban/Industrial Areas

(Unit: ha)

CODE	NUEVA ECIJA	TARLAC	ZAMBALES	PAMPANGA	BULACAN	BATAAN	CENTRAL LUZON
POTENTIAL AREAS							
Lowland (< 8 %)	2,660	0	1,644	1,000	77	9	5,390
Upland (8-18 %)	2,509	4,573	3,822	2,141	14,255	4,581	31,881
TOTAL	5,170	4,573	5,466	3,141	14,332	4,590	37,272
EXISTING AREAS	14,403	7,415	6,863	11,813	23,383	2,490	66,367

Source: GIS analysis by the JICA Study Team

Table 4.5 Features of Major Rivers in Central Luzon

River ID No.	NWRB Code	River Name	Catchment Area (Km2)	Annual Rainfall (mm)	Runoff Coefficient	Annual Runoff (MCM)
2500	059	Pampanga	9,759	2,250	0.50	10.98
2501	055	Angat	959	3,000	0.51	1.45
25011		Angat Dam				
2502	056	Penaranda				
2503	057	Coronel	709	3,000	0.72	1.53
2504		Digmala				
2505	058	Carranglan				
25055		Pantabangan Dam				
2506		Talavera				
2507		Rio Chico	431	2,000	0.56	0.48
2508		Bamban/Others	1,177	1,900	0.63	1.40
2509		Abacan/Others				
2600		Pasig Potrero/Porac	255	2,000	0.65	0.33
2700		Gumain/Caulaman/Colo	717	2,500	0.65	1.17
2800		Hermosa	61	2,600	0.65	0.10
2900		Orani	83	2,700	0.65	0.15
3000	060	Pilar	178	2,700	0.65	0.31
3100		Orion	61	2,700	0.65	0.11
3200		Miray Cr.	29	2,700	0.65	0.05
3300		Lamao	58	2,700	0.65	0.10
3400		Amo	40	2,700	0.65	0.07
3500		Alasasin	70	2,900	0.65	0.13
3600		Mariveles	53	3,100	0.65	0.11
3700		Agloloma	54	3,200	0.65	0.11
3800		Dinuangan	49	3,200	0.65	0.10
3900		Panayan	54	3,200	0.65	0.11
4000		Umagol	75	3,100	0.65	0.15
4100		Batalan	20	3,100	0.65	0.04
4200		Bayandati	50	3,100	0.65	0.10
4300	061	Moron	80	3,200	0.65	0.17
4400		Sta. Rita	73	3,100	0.65	0.15
4500		Calapandayan	121	2,900	0.65	0.23
4600		Marelalec	63	3,000	0.65	0.12
4700		Cawag	59	3,200	0.65	0.12
4800		Agusuhin	33	3,200	0.65	0.07
4900		Silanguin	35	3,400	0.65	0.08
5000		Wildhorse Cr.	24	3,400	0.65	0.05
5100		Deer Cr.	20	3,400	0.65	0.04
5200		Pundaquit	18	3,400	0.65	0.04
5300	062	Pantawan	347	3,100	0.65	0.70
5400	063	Sto. Tomas	263	2,900	0.65	0.50
5500		Anonang	255	2,900	0.65	0.48
5600		Dalayan	66	3,000	0.65	0.13
5700	064	Bucao	734	2,600	0.65	1.24
5800	065	Bancal	188	2,800	0.65	0.34
5900		Bagsit	148	2,900	0.65	0.28
6000		Pedro	44	3,100	0.65	0.09
6100		Alasa	120	3,000	0.65	0.23
6200		Bunga	88	3,000	0.65	0.17
6300	066	Lawis	455	2,800	0.65	0.83
6400		Agnacon	44	3,000	0.65	0.09
6500		Pinalabanan	154	3,000	0.65	0.30
6600		Nayom	155	3,000	0.65	0.30
6700		Banog	65	3,000	0.65	0.13
7701	071	Camiling	604	2,200	0.65	0.86
7702	072	O'Donel	1,896	2,000	0.65	2.46
Total			21,094			29.29

Table 4.6 Groundwater Potential in Central Luzon

Province	Shallow Well Area (km2)	Deep Well Area (km2)	Difficult Area (km2)	Total Area (km2)	AVERAGE CAPACITY per Well (1,000 lpd)			WATER INFLOWS (1,000 lpd) (Mil. m3/year for value in parenthesis)			MAXIMUM POTENTIAL Number of Wells		
					SW	DW	Total	SW	DW	Total	SW	DW	Total
Bataan	206 (15%)	0 (0%)	1,167 (85%)	1,373 (100%)	57.11	0	57.11	235,875 (86)	0 (0)	235,875 (86)	4,130	0	4,130
Bulacan	1,330 (50%)	540 (20%)	802 (30%)	2,672 (100%)	43.85	141.15	58.08	941,818 (344)	519,418 (190)	1,461,236 (533)	21,480	3,680	25,160
Nueva Ecija	2,724 (52%)	1,160 (22%)	1,400 (26%)	5,284 (100%)	22.81	335.52	33.82	2,044,596 (746)	1,097,145 (400)	3,141,741 (1,147)	89,620	3,270	92,890
Pampanga	1,850 (85%)	41 (2%)	290 (13%)	2,181 (100%)	51.45	189.77	52.76	1,449,774 (529)	51,238 (19)	1,501,012 (548)	28,180	270	28,450
Tarlac	1,600 (52%)	450 (15%)	1,003 (33%)	3,053 (100%)	54.09	151.87	65.39	816,288 (298)	299,185 (109)	1,115,473 (407)	15,090	1,970	17,060
Zambales	930 (25%)	200 (5%)	2,584 (70%)	3,714 (100%)	47.78	195.26	80.24	579,081 (211)	667,800 (244)	1,246,881 (455)	12,120	3,420	15,540
Total	**8,643 (47%)**	**2,392 (13%)**	**7,248 (40%)**	**18,282 (100%)**	**35.56**	**208.94**	**47.51**	**6,069,435 (2,215)**	**2,635,504 (962)**	**8,704,939 (3,177)**	**170,620**	**12,610**	**183,230**

Source of basic data: National Water Resources Council (NWRC), 1982

Note:
SW - Shallow well
DW - Deep well
lpd - liters per day

Table 4.7 Projected Water Demand in 2010 and Compparison with Estimated Water Use in 1990

(Unit: million m3/year)

Province	Estimated Water Use in 1990				Projected Water Demand in 2010			
	Domestic	Industrial	Irrigation	Total	Domestic	Industrial	Irrigation	Total
Bataan	9.9	9.7	151.7	171.2	39.3	52.0	137.3	228.7
Bulacan	36.1	21.2	484.8	542.2	139.4	92.9	451.8	684.1
Nueva Ecija	26.6	3.8	1,659.1	1,689.4	77.9	83.9	1,753.8	1,915.6
Pampanga	35.7	7.7	435.1	478.5	137.6	33.4	455.5	626.5
Tarlac	17.2	3.6	864.0	884.8	47.3	41.3	845.3	933.9
Zambales	9.8	1.4	60.9	72.1	48.6	20.9	46.0	115.6
Central Luzon	135.2	47.4	3,655.7	3,838.2	490.1	324.4	3,689.8	4,504.2

Source: JICA Study

Table 4.8. Characterization of Urban Centers in Upper Tiers of Urban Hierarchy for Central Luzon.

Hierarchy	Urban Center	Characteristics/Functions
Regional Center	San Fernando	Regional and Provincial administration, industrial area with food & beverage, furniture & fixture etc., regional distribution center.
Sub-Regional Centers	Cabanatuan City	Primary trade center, education center with higher education institutes.
	Olongapo City	International trade and communication centers, industrial area with light industries, secondary tourism center.
	Malolos	Provincial administration, financial center, cultural and secondary tourism center, distribution and marketing center.
Major Urban Centers	Angeles City	International trade center, industrial center with footloose industries.
	Tarlac	Provincial administration, agro-industrial center, agricultural distribution center.
	Palayan City	Provincial administration, orchard city, agro-processing center, gateway to Aurora.
	San Jose City	Secondary trade center, gateway to Cagayan Valley.
	Gapan	Secondary trade center
	Dinalupihan	Non-industrial services center, secondary trade center.
	Balanga	Provincial administration, agricultural distribution center.
	Marives	Agro-Industrial Growth Center (designated).
	Iba	Provincial administration, coastal tourism and fishery center.
	Baliuag	Agro-processing center
	Meycauayan	Food processing center, specialized export processing zone (jewelry)

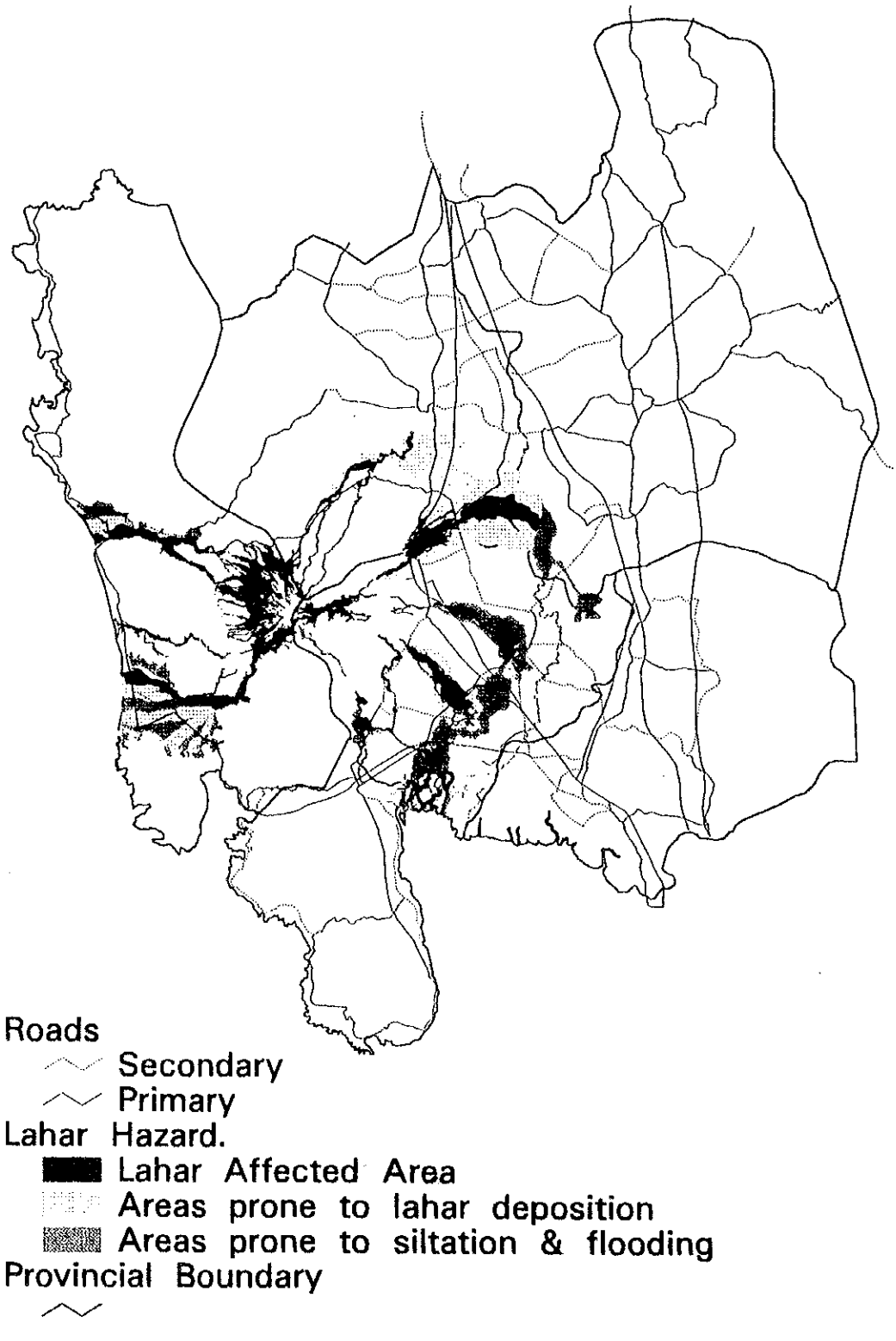


Figure 4.1 Lahar Hazard Area

Figure 4.2 Schematic Illustration of Proposed Land Use in Various Scenarios

legal status	A & D LANDS						PRODUCTION FOREST	PROTECTION FOREST
pedoecological zone	WARM LOWLANDS				WARM COOL UPLANDS		WARM COOL HILLYLANDS	COOL HIGHLANDS
existing land use	IRRIGATED PADDY	RAINFED PADDY	GRASSLANDS	DIVERSIFIED CROPS	DIVERSIFIED CROPS	GRASSLANDS	FOREST OR GRASSLANDS	FORESTS
potential land use	IRRIGATED PADDY	PADDY, CORN, VEGETABLE & DIVERSE COMMERCIAL CROPS			DIVERSE UPLAND & COMMERCIAL	MANAGED PASTURE	AGROFORESTRY & TREE CROPS	PROTECTION AREAS
proposed land use localization	IRRIGATED PADDY	MIXED FARMING, RICE & CORN WITH VEGETABLES AND PULSES		DIVERSIFIED CROPS	MULTI-STOREY FARMING		AGRO FORESTRY	PROTECTION AREAS
proposed land use globalization	IRRIGATED PADDY	COMMERCIAL VALUE ADDED CROPS EXPORT ORIENTED			MULTI-STOREY FARMING	MANAGED PASTURE	TREE CROPS	PROTECTION AREAS
proposed land use glocalization	IRRIGATED PADDY	MIXED FARMING	COMMERCIAL CROPS	DIVERSIFIED CROPS	MULTI-STOREY FARMING	MANAGED PASTURE	AGROFORESTRY & TREE CROPS	PROTECTION AREAS

Figure 4.3 Proposed Land Use in 2010 in Localization Scenario

Road

Provincial Boundary

Lowland Prime Lands
- Irrigated Paddy
- Rainfed Diversified Commercial Crops

Upland Prime Lands
- Diversified Commercial Crops & Tree Crops also suited for Managed Pasture
- Managed Pasture Land also Moderately to Marginally Suitable for Some Commercial Crops and Tree Crops

Fishing Areas

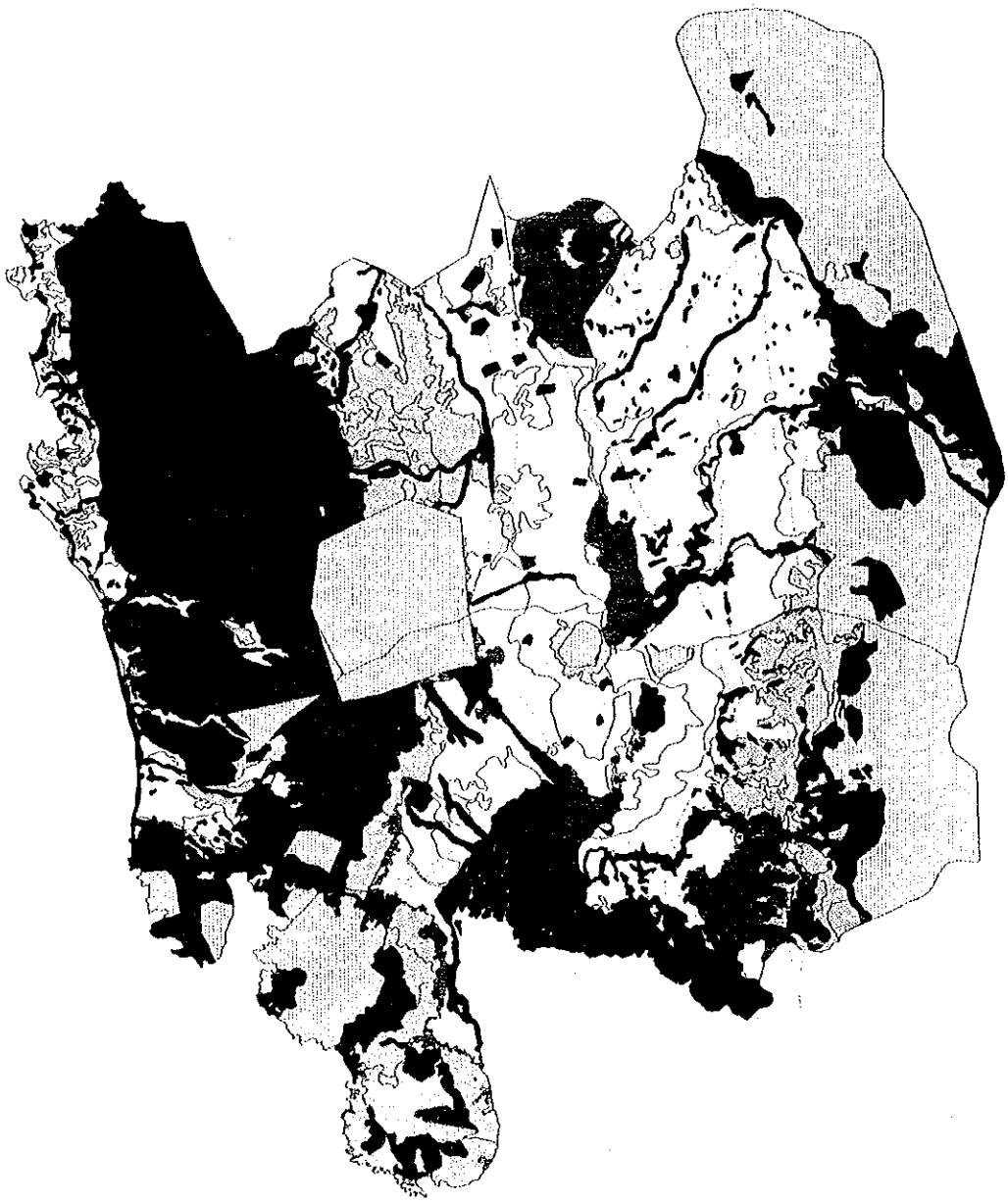
Protection Areas

Not Suitable for Agriculture

Production Forest
- Moderately/Marginally suitable for Tree Crops & Managed Pasture
- Not Suitable for Crop Cultivation

Miscellaneous

Figure 4.4 Proposed Land Use in 2010 in Globalization Scenario



Road

Provincial Boundary

Lowland Prime Lands
- Irrigated Paddy
- Rainfed Mixed Farming (Paddy & Vegetables)
- Rainfed Diversified Crops
- Diversified Commercial Crops & Tree Crops

Upland Prime Lands
- Diversified Upland Crops, Tree Crops & Commercial Crops
- Managed pasture Land also Moderately to Marginally Suitable for Some Commercial Crops & Tree Crops

Fishing Areas

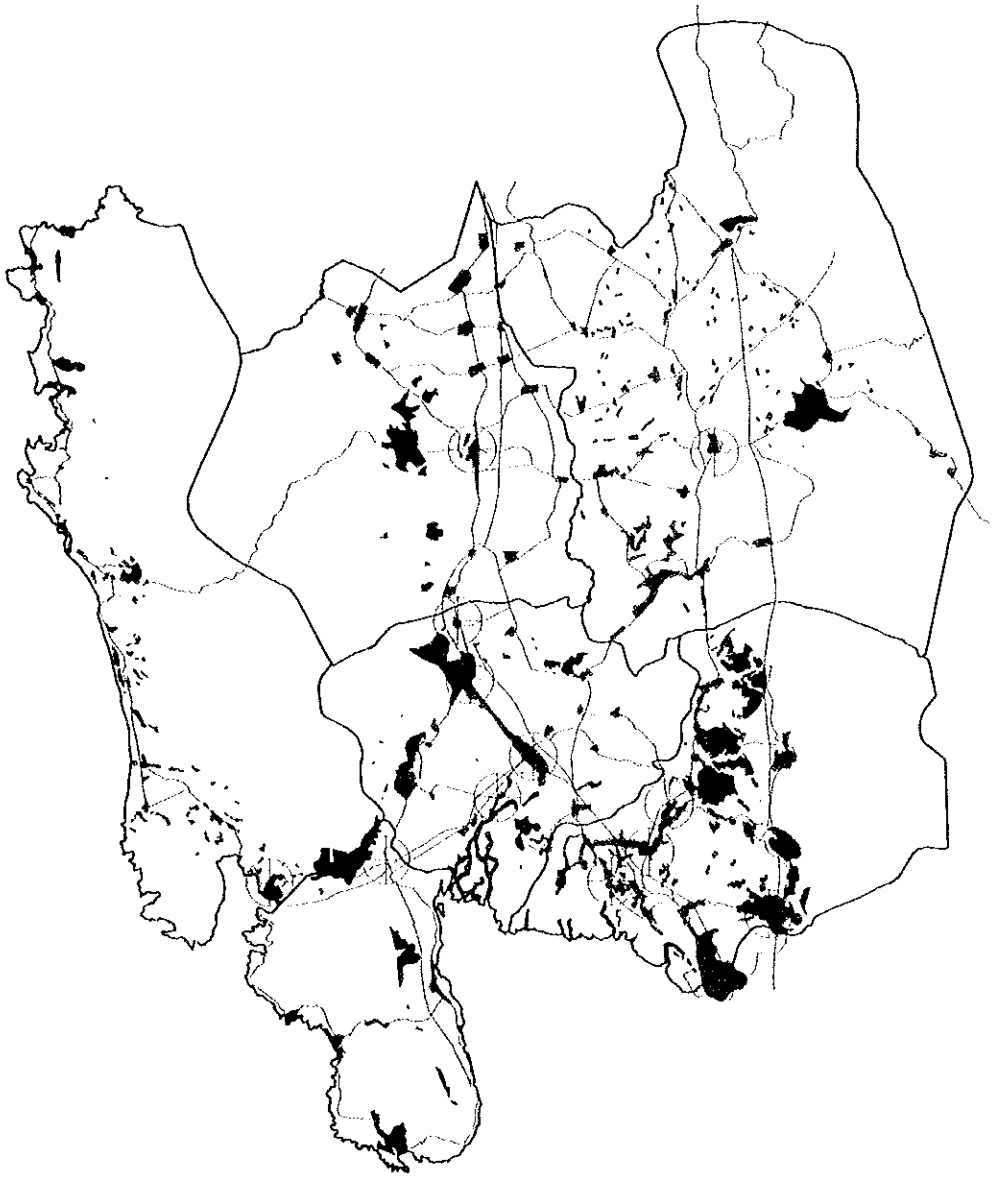
Protection Areas

Not Suitable for Agriculture

Production Forest
- Moderately/Marginally suitable for Tree Crops & Managed Pasture
- Not Suitable for Crop Cultivation

Miscellaneous

Figure 4.5 Proposed Land Use in 2010 in Glocalization Scenario



Major Urban Centers

Road

Provincial Boundary

Pinatubo Resettlement Areas

Potential Urban/Industrial Areas (Lowland & Upland)

Existing Builtup and Industrial Areas

Figure 4.6 Potential Urban/Industrial Areas

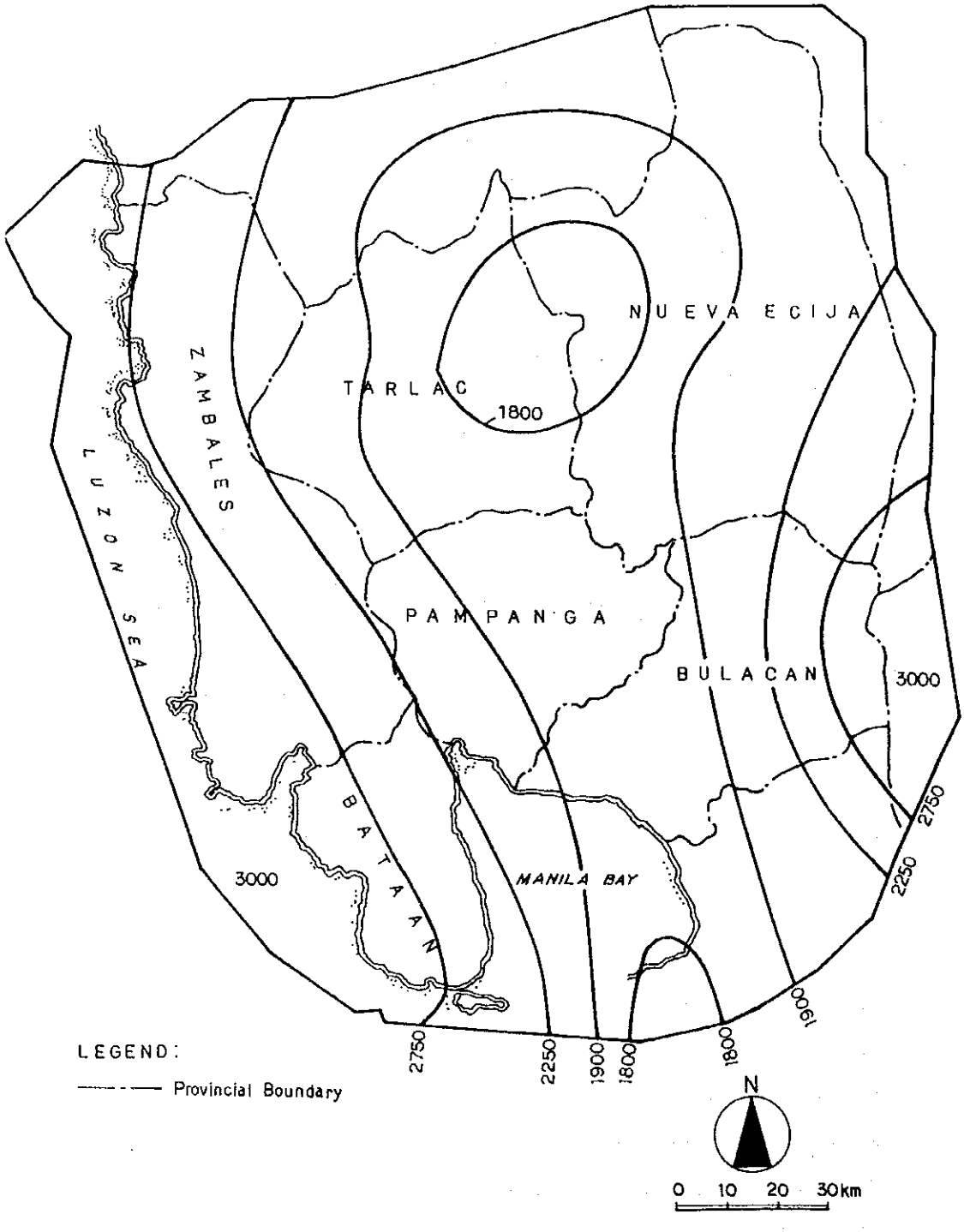


Figure 4.7 Isohyetal Map of Annual Rainfall

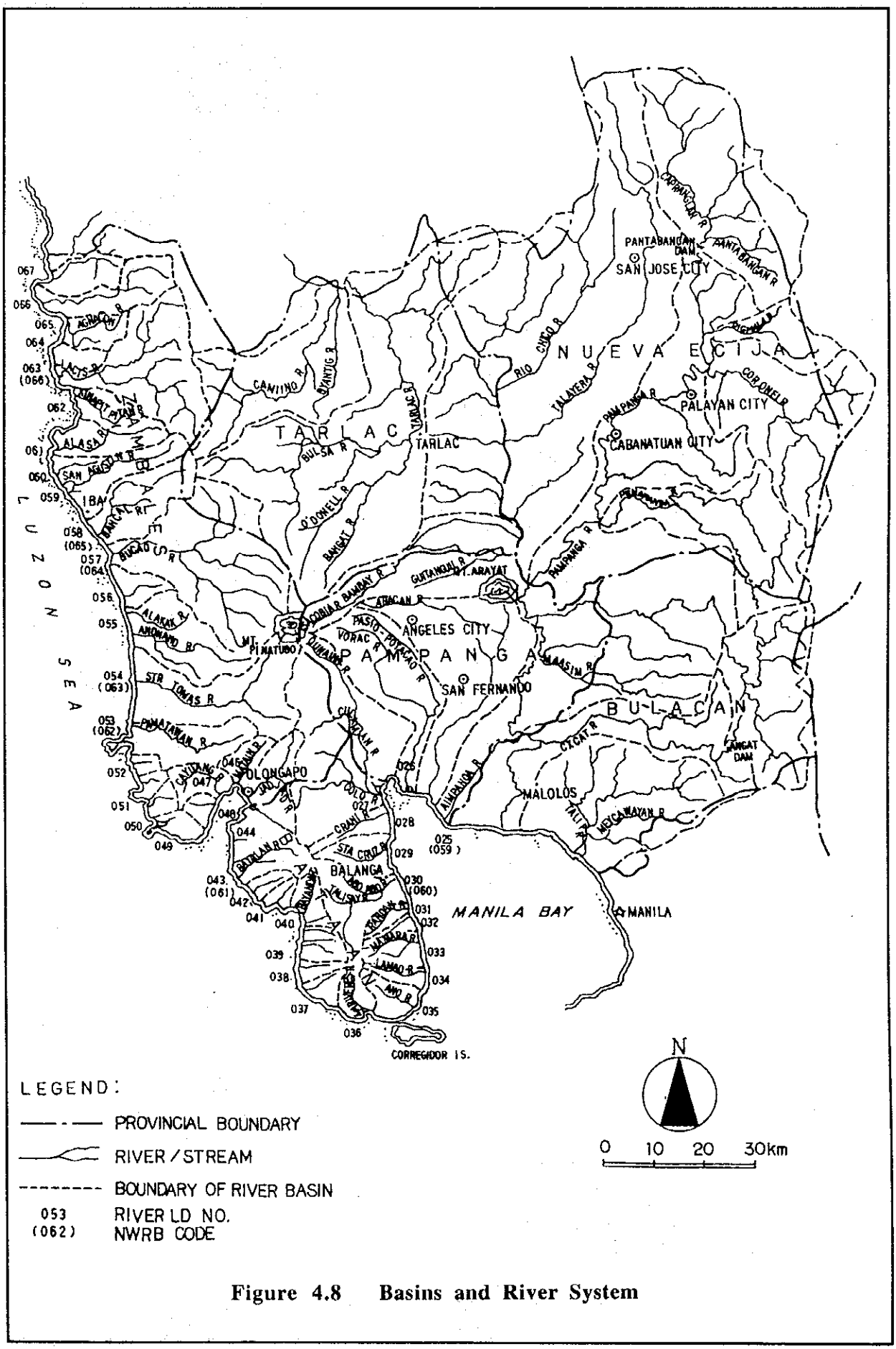


Figure 4.8 Basins and River System

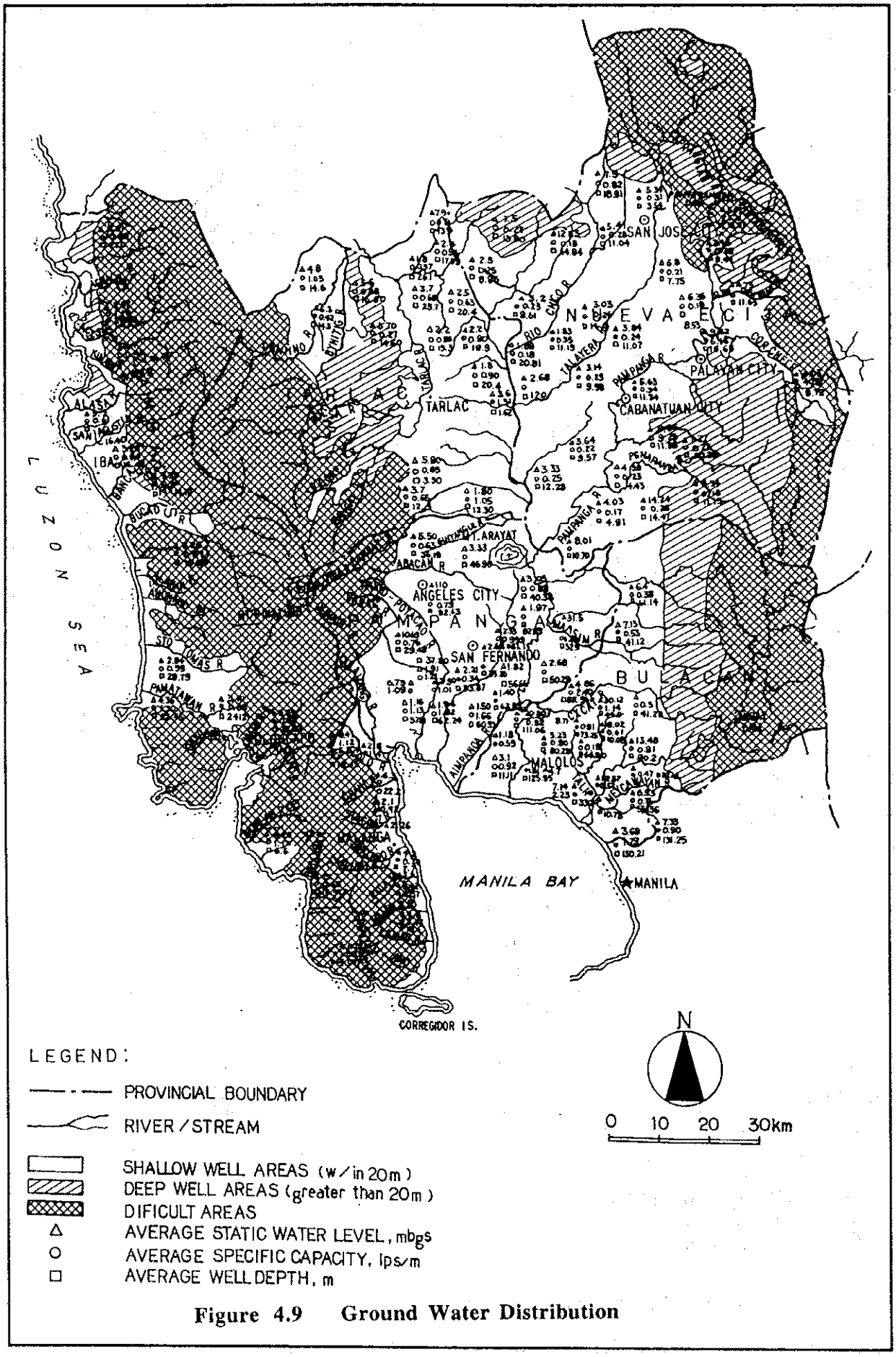


Figure 4.9 Ground Water Distribution

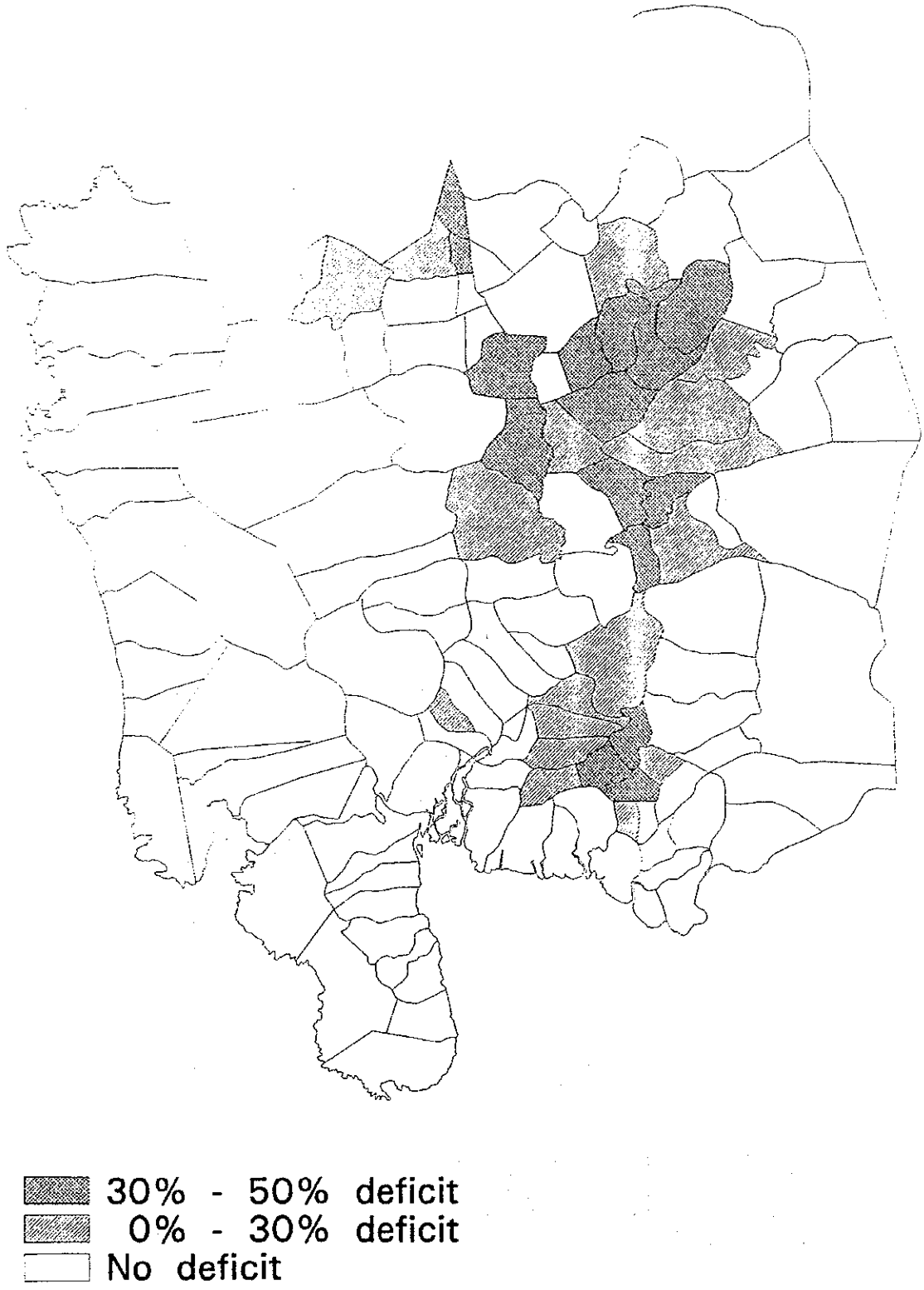


Figure 4.10 Deficits of Irrigation Water in 2010 as Compared with Surface Water Availability

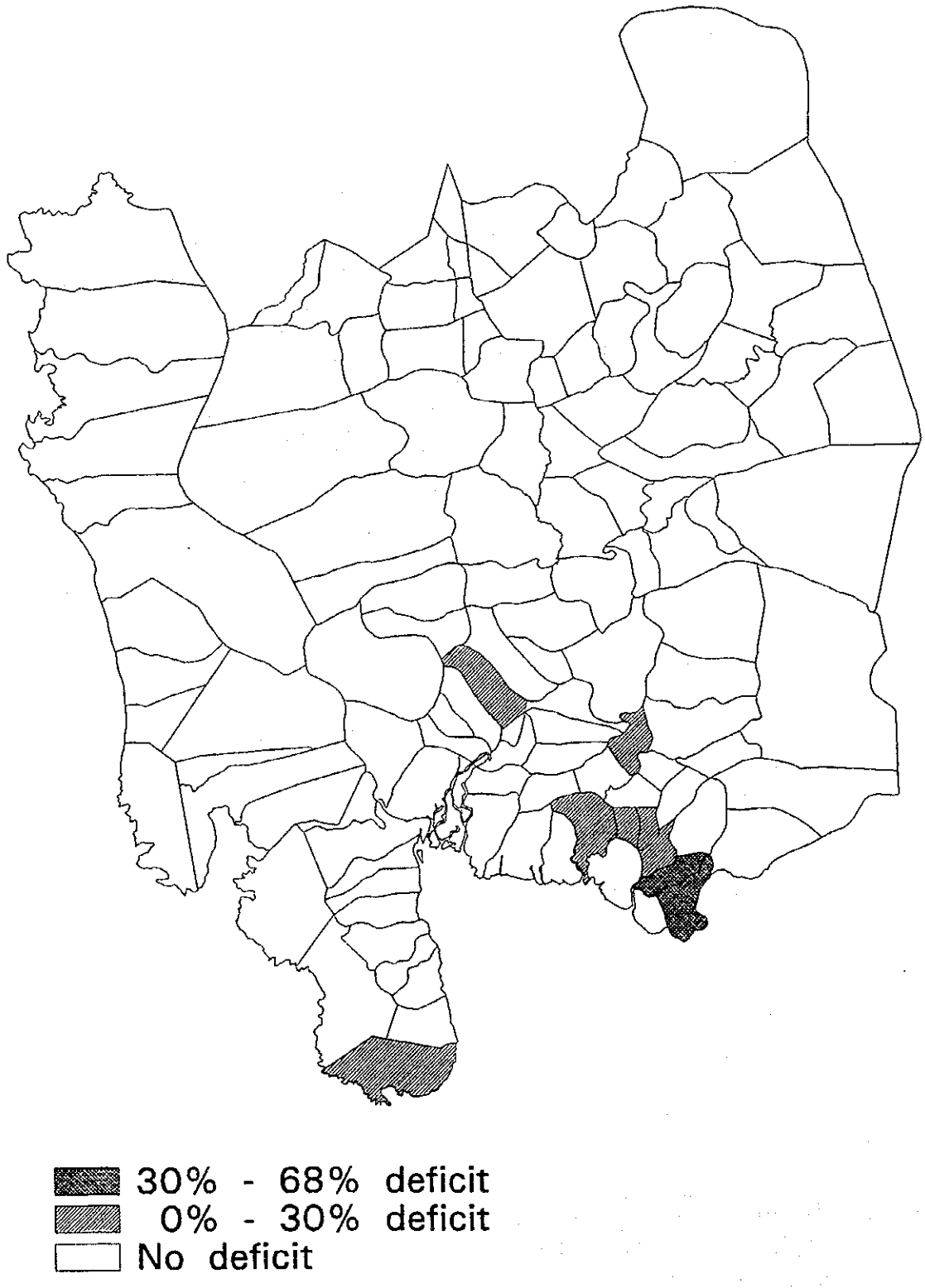
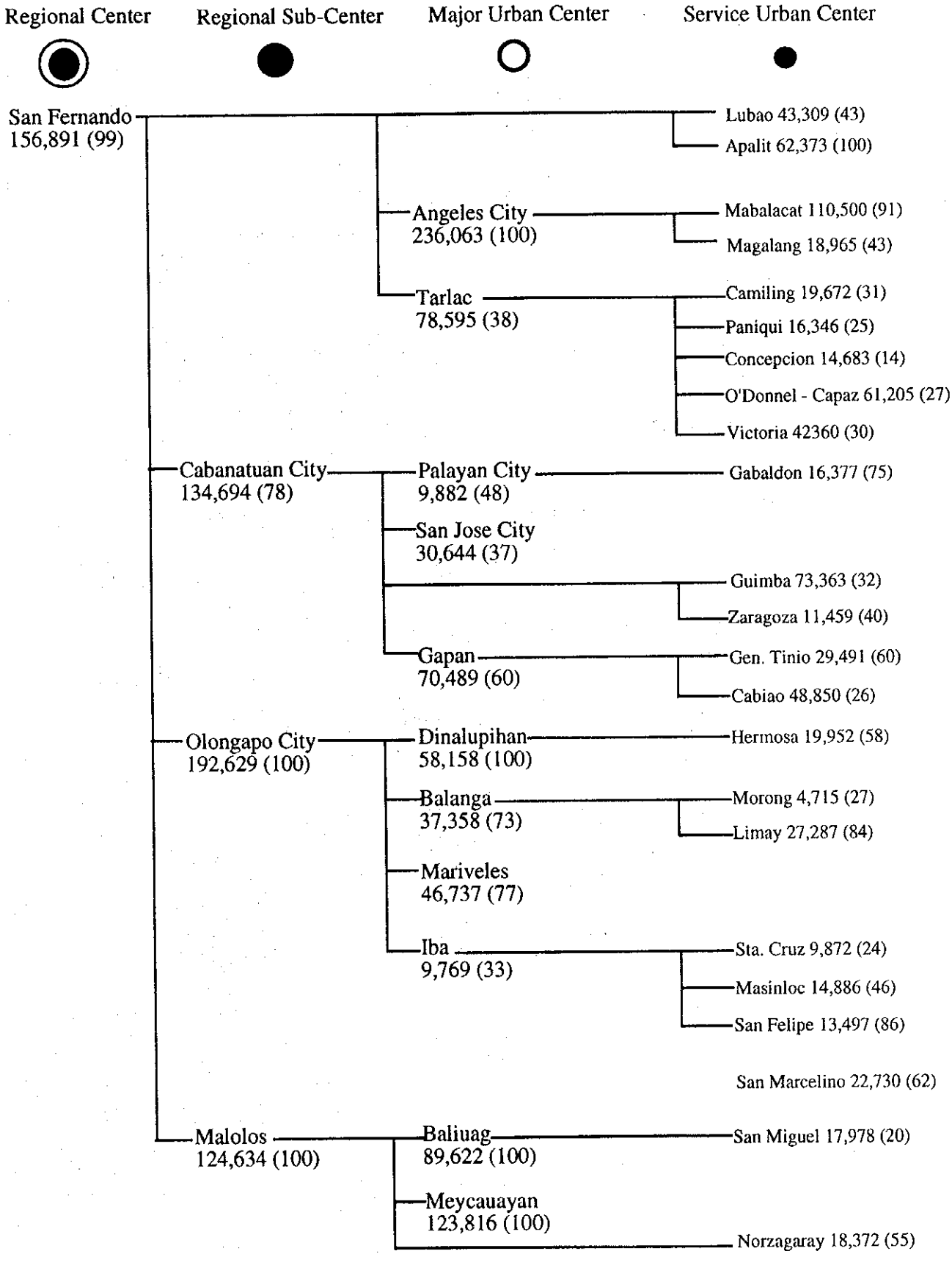


Figure 4.11
Dificits of Domestic and Industrial Water in 2010 as Compared with Ground Water Potential

Figure 4.12 Proposed Hierarchy of Urban Centers in Central Luzon



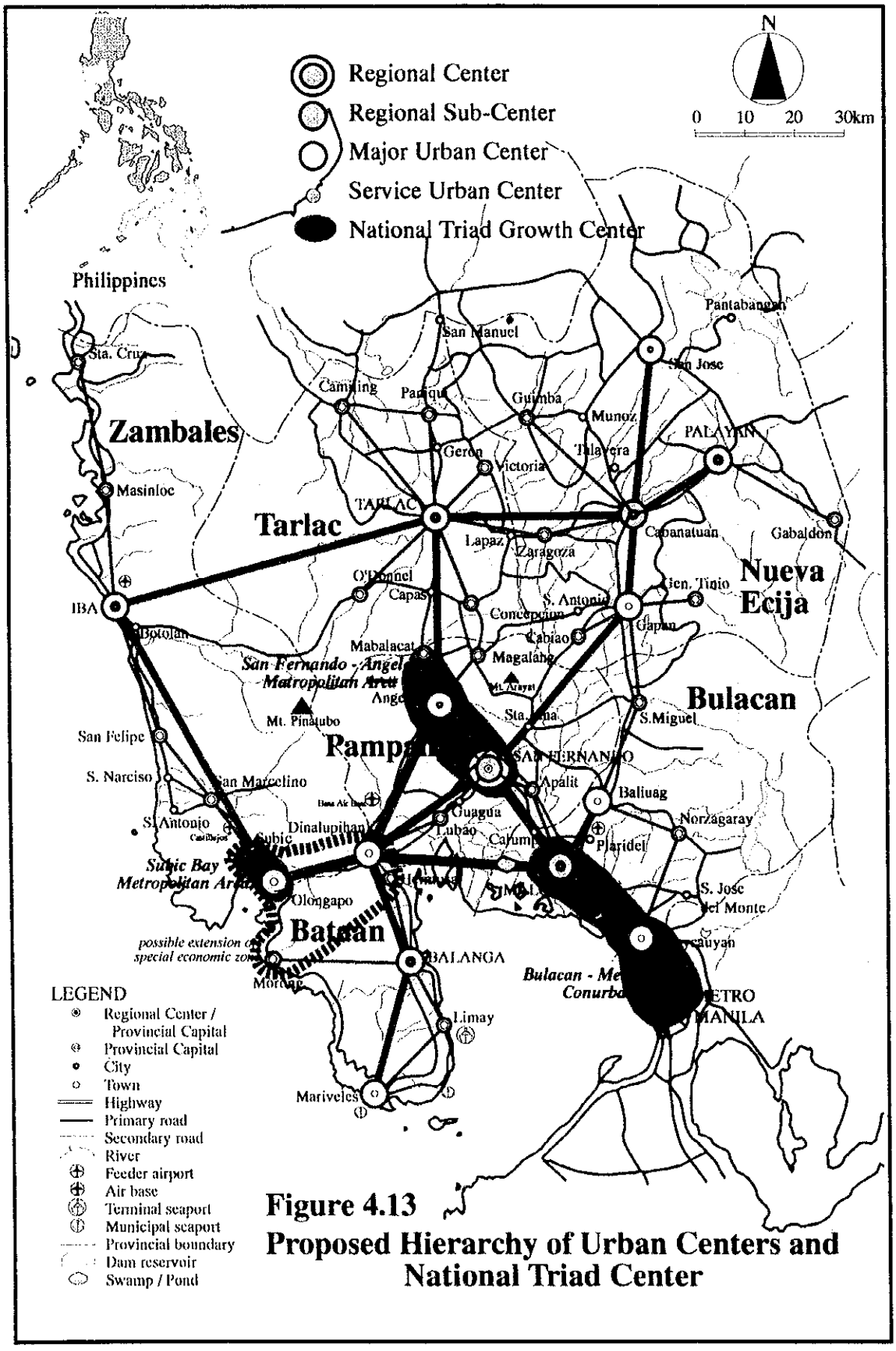


Figure 4.13
Proposed Hierarchy of Urban Centers and National Triad Center

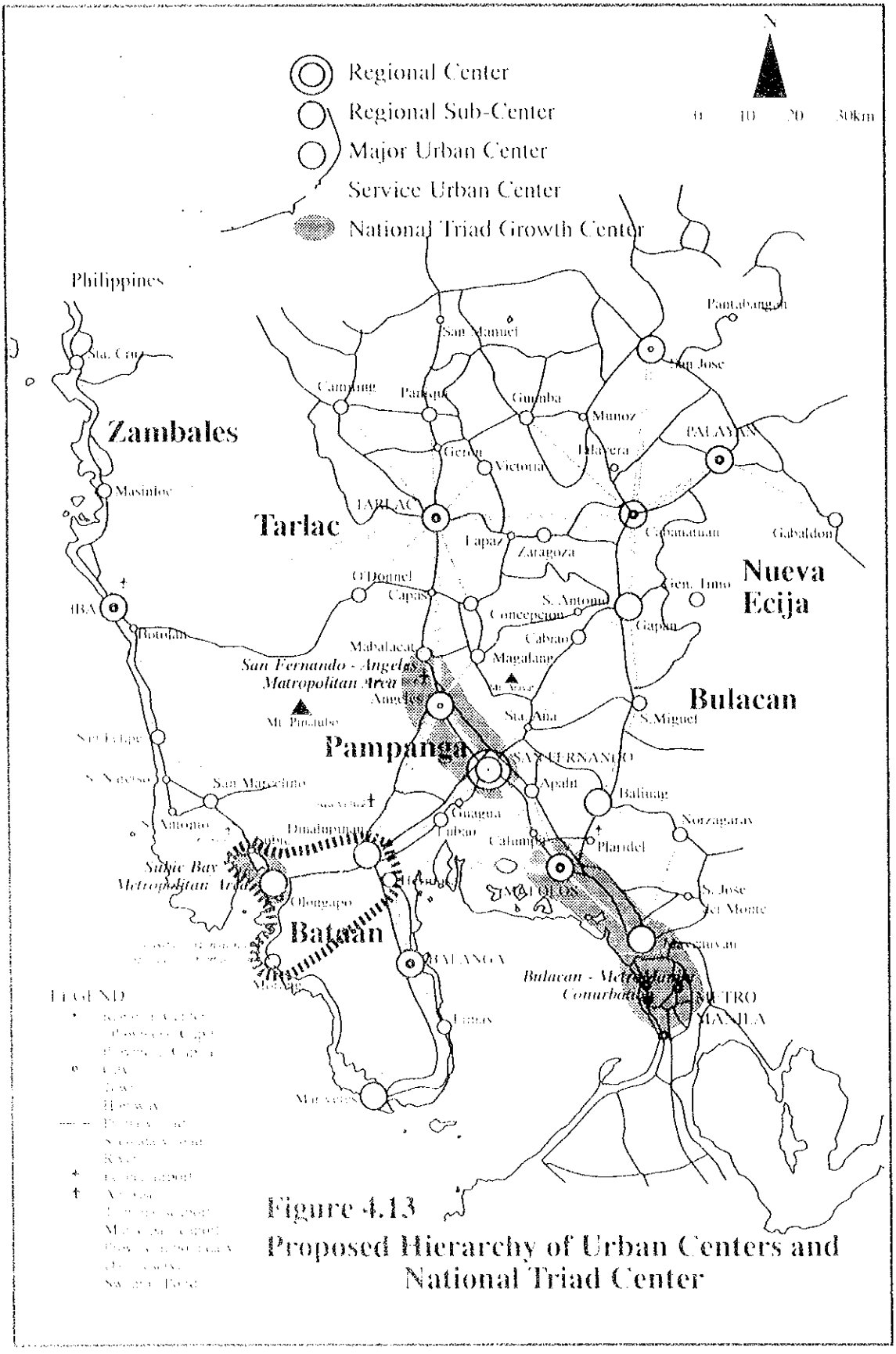


Figure 4.13
Proposed Hierarchy of Urban Centers and National Triad Center

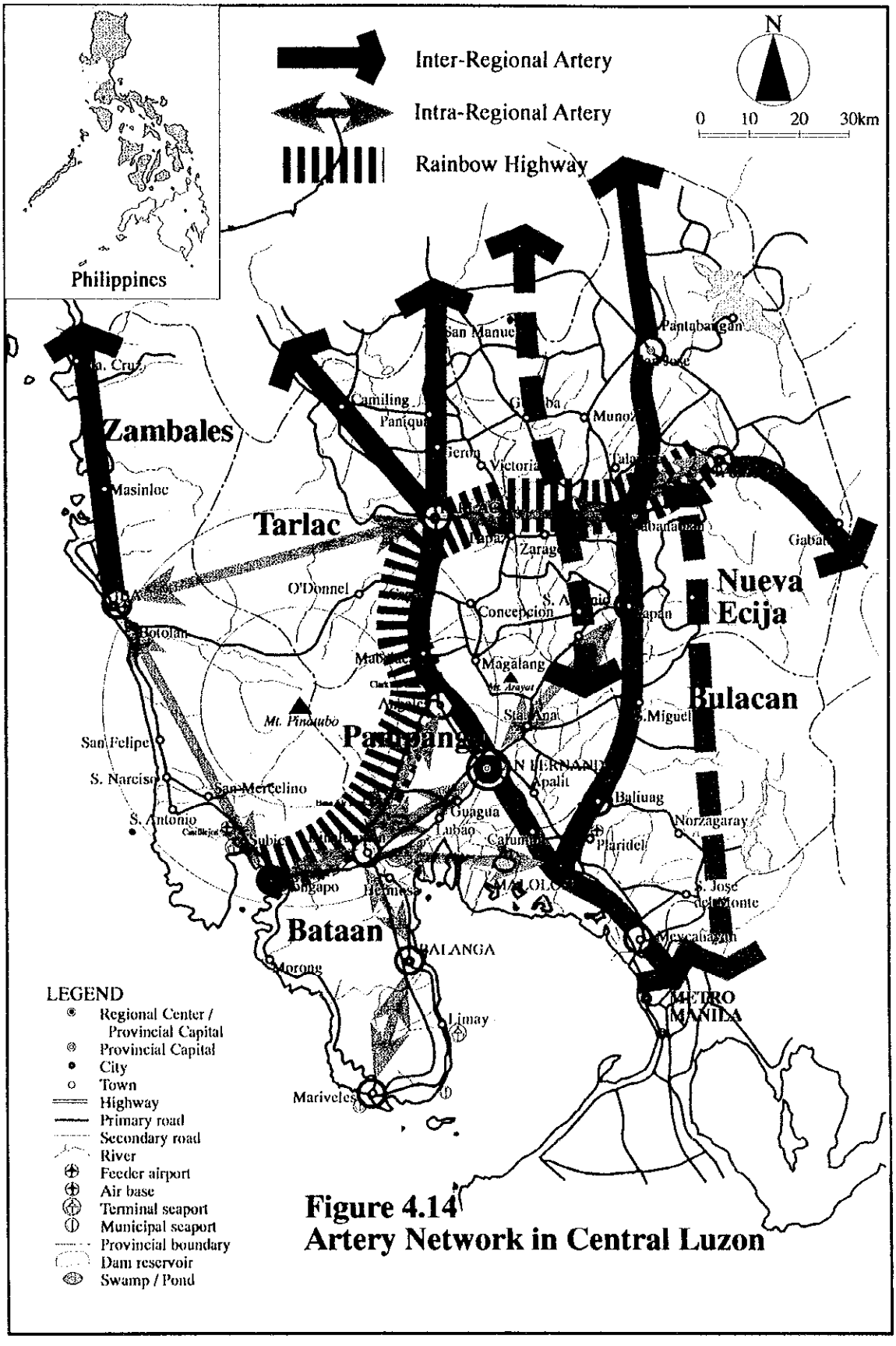


Figure 4.14
Artery Network in Central Luzon

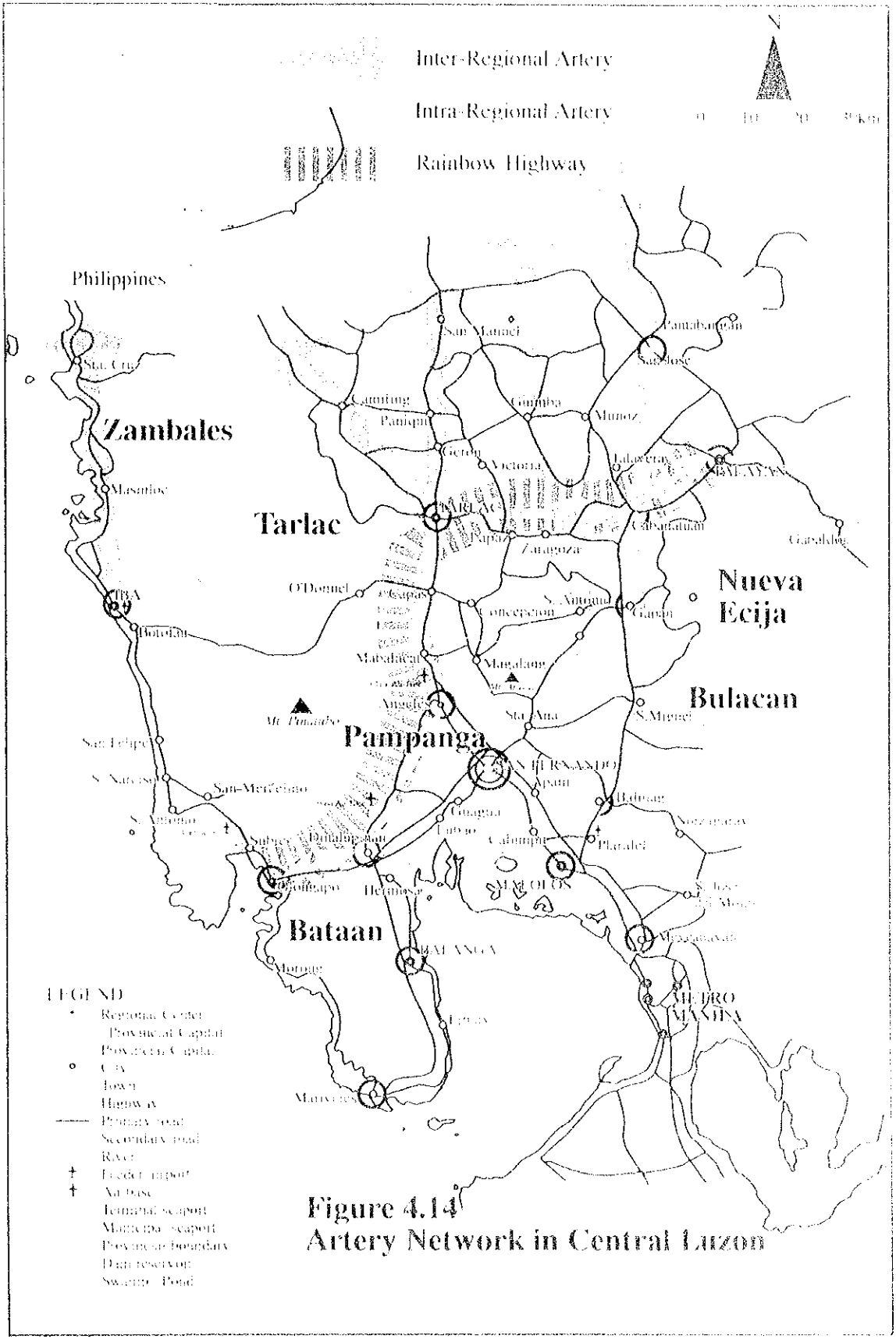


Figure 4.14
Artery Network in Central Luzon

4.2 Socio-Economic Frameworks

4.2.1 Economic growth under alternative development scenarios

Expected growth of value-added in Central Luzon is estimated by broad economic sector under the alternative development scenarios of Localization, Globalization and Glocalization. The agricultural value-added is estimated based on the proposed land use under each scenario presented in subsection 4.1.1 and dominant crops and other agricultural activities assumed for each land use category. Those crops having higher value-added per ha have been selected, and viable combinations of crops have been designated for areas under mixed or multi-storey farming.

The manufacturing value-added under the Localization scenario is calculated by assuming ratio of various agro-products to be processed within the region. Under the Globalization, the manufacturing value-added is estimated on the assumption that Central Luzon would contribute to 10% of the export target for the Philippines. The manufacturing value-added under the Glocalization combines these agro-processing and export industries, and reflects also additional industries induced due to linkage effects. The latter value-added is estimated by using the input-output table for the Philippines.

The service value-added is estimated by multiplier with respect to agriculture and industry. Different multiplier values are assumed under the alternative development scenarios in line with their respective concepts.

The value-added projections are summarized below. Agricultural growth would be the highest under the Glocalization attaining 4.5% per annum, closely followed by the Localization at 4.3% per annum. Under the Globalization, agriculture would grow at 4.0% per annum.

Value-Added Projection for Central Luzon under Alternative Scenarios

(Unit: P x 10^6 at 1990 price)

	1990	2010		
		Localization	Globalization	Glocalization
Agriculture	21,468	49,700	46,000	51,700
Industry	36,910	95,000	194,000	214,300
Services	35,780	107,900	171,000	192,100
Total	94,158	252,600	410,200	458,100
Growth rate (% p.a.)		5.06	7.64	8.23

		Localization	Globalization	Glocalization
Service multiplier to :	Agriculture	0.45	0.35	0.40
	Industry	0.90	0.80	0.80

Source: NSO for 1990, JICA Study Team for 2010

The Glocalization would attain naturally the highest industrial growth, as it would combine and link the growth in agro-industries under the Localization and the growth in export industries under the Globalization. Industrial growth under the Localization would be minimal at 4.8% per annum.

The overall growth of the gross regional domestic products (GRDP) attains 8.2% per annum under the Glocalization, substantially higher than 7.6% per annum under the Globalization. Under the Localization, comparatively more service activities would be induced by both by both agriculture and industry, but the overall growth of the GRDP would be the lowest at 5.1% per annum.

4.2.2 Agriculture and manufacturing activities under Glocalization

(1) Agriculture

The projection of agricultural value-added by crop, livestock and fishery under the Glocalization is summarized in Table 4.9 and compared with the present conditions. The value-added due to livestock and poultry would record the highest growth at 5.0% per annum, followed by the crop value-added at 4.4% and the fishery value-added at 4.1% per annum.

The production of rice would increase at 2.85% per annum to keep pace with the population increase (subsection 4.3.3), and exceed the self-sufficiency level by 50%. Corn production would increase significantly to support the boosting livestock production. Of other crops, those commercial crops with very limited production at present would attain high growth rates of production exceeding 10% per annum. These are cashew, peanut, coffee and cacao. Other fruits would increase marketable production due to reduction in losses as well as increase in cultivated area. Vegetables production would increase at 7.1% per annum, represented by eggplant, tomato, onion, squash and okra. Some specialized high value vegetables would also expand production such as asparagus and garlic.

The livestock value-added would be dominated by hog and poultry, although cattle production would increase at the highest rate of 5.0% per annum. Fishery production would be dominated by aquaculture. Central Luzon would attain 80% self-sufficiency in meat as compared to 45% in 1990 and maintain 73% self-sufficiency in fish.

(2) Manufacturing

The projection of value-added of manufacturing covered by the 1990 Industrial Survey under the Glocalization is summarized and compared with the present conditions in Table 4.10.

Also shown are provincial breakdowns in 1990 and 2010, and the value-added projection for other manufacturing industries, construction, utilities and mining.

The manufacturing sub-sector structure in Central Luzon would change significantly from 1990 to 2010. Food & Beverage would continue to be the dominant sub-sector, but its share in the manufacturing value-added would decrease from 43.1% in 1990 to 27.2% in 2010. Sub-sector industries that would increase shares are Wearing Apparel & Footwear (4.9% in 1990 to 8.8% in 2010), Furniture & Fixture (1.4% to 2.2%), Chemicals & Chemical Products (2.3% to 13.8%), Fabricated Metal Products (0.6% to 1.5%), and Electrical Machinery & Equipment (4.3% to 26.7%). These are all strategically important sub-sectors under the Glocalization. The large increase in Chemicals & Chemical Products is due to a petro-chemical complex in Bataan.

Of the strategic industries, Wearing Apparel & Footwear and Electrical Machinery & Equipment are distributed mainly in Bataan, Bulacan and Pampanga, and Fabricated Metal Products mainly in Bulacan and Pampanga. Pampanga is dominant in Furniture & Fixture. Pampanga would also contribute to 46% of the value-added in Food & Beverage in 2010 followed by Bulacan with a 23% share. Food & Beverage and Electrical Machinery & Equipment are most important sub-sectors in 2010 in both Nueva Ecija and Zambales. Bulacan dominates None-Metallic Products with a 59% share in this sub-sector value-added in 2010.

4.2.3 Population distribution under Glocalization

The projected levels of economic activities under the Glocalization are interpreted into employment by sector by assuming labour productivity by sector. Employment in industry has been estimated separately following the industrial value-added estimate. The total employment in industry is estimated at 1,021,000 in 2010. This makes the labour productivity in industry P210,000 in 2010, representing a growth at the average annual rate of 4.5% from P87,000 in 1990. The labour productivity in agriculture and services in 2010 are assumed to be P55,000 and P90,000, respectively corresponding to two-fold end three-fold increases from the 1990 levels.

Applying the labour productivity by sector, employment by sector under the Glocalization is projected as follows.

Employment Projection for Central Luzon under Glocalization

	(unit:1,000;% share in parenthesis)	
	1992	2010
Agriculture	776	940 (22.9)
Industry	513	1,021 (24.9)
Services	1,099	2,134 (52.0)
Total	2,388	4,095 (100.0)

Source: JICA Study Team

The total employment of 4,095,000 in 2010 may be converted to the total population by assuming labour force coefficient and labour participation ratio. The ratio of working age population or labour force coefficient would not change much from the 1990 level of 0.65, given the age structure of population. Labour participation ratio may change reflecting urbanization, income increase, change in women's position and other factors which together may work in either direction. If no change is assumed in labour participation ratio, the total population in Central Luzon is calculated to be 10,500,000 in 2010.

The population in Central Luzon is projected to the year 2010 by municipality separately for urban and rural populations. The projection of urban population is in line with the hierarchical structure of urban centers, which reflects present accumulation of urban population and services, existing and expected functions of urban centers, and locational conditions. Rural population is assumed to stay at present levels, indicating the loss of rural population would stop due to revitalization of rural economy. Projected urban and rural populations by municipality are adjusted to fit to trend increases and to reflect the land use plan under the Glocalization and distribution of potential urban/industrial areas.

Projection results for major urban centers and provinces are given in Table 4.11. Projected urban and rural populations are summarized below by province.

Projected Urban and Rural Population by Province in Central Luzon

				(1990-2010 growth rate p.a. in parenthesis)		
	1990			2010		
	Urban	Rural	Total	Urban	Rural	Total
Bataan	317,528	108,275	425,803	680,000 (3.91)	114,000 (0.26)	798,000 (3.19)
Bulacan	1,199,906	305,313	1,505,219	2,446,000 (3.62)	270,000 (0.61)	2,716,000 (3.00)
Nueva Ecija	511,549	801,131	1,312,680	1,119,000 (3.99)	799,000 (0.01)	1,918,000 (1.91)
Pampanga	1,079,806	452,809	1,532,615	2,356,000 (3.75)	427,000 (0.29)	2,783,000 (3.03)
Tarlac	256,594	603,114	859,708	597,000 (4.31)	669,000 (0.52)	1,266,000 (1.95)
Zambales	365,690	197,302	562,992	832,000 (4.20)	186,000 (0.29)	1,018,000 (3.00)
Central L.	3,733,797	2,467,944	6,199,017	8,034,000 (3.91)	2,465,000 (0.00)	10,499,000 (2.67)

Source: Table 4.11

Urban population in the National Triad Growth Centers is calculated from Table 4.11 as follows.

Urban Population in National Triad Growth Centers in 1990 and 2010

	Constituents	Urban Population	
		1990	2010
Subic Bay Metropolitan Area	Olongapo City, Subic	229,000	545,000
with extension	Dinalupihan, Hermosa, Morong	312,000	744,000
San Fernando-Angeles Metropolitan Area	San Fernando, Angeles City, Mabalacat, St. Thomas, Mexico, Guagua	686,000	1,568,000
Bulacan Conurbation	15 Municipalities in Bulacan	923,000	1,899,000

Source: Table 4.11

Combined population of the National Triad Growth Centers, if the extension area of Dinaluphan, Hermosa and Morong is included, would be 4,126,000 in 2010, accounting for 51% of the total urban population in Central Luzon.

Table 4.9 Agricultural Value-Added Projection by Crop, Livestock and Fishery in Central Luzon under Glocalization

		1990		Glocalization	
	GVA/TON	Volume	GVA	Volume	GVA
Province	(Pesos)	(MT)	(Pesos)	(MT)	(Pesos)
Palay	3,859	1,910,930	7,374,278,870	3,349,000	12,923,791,000
Corn	3,721	17,304	64,388,184	248,175	923,459,175
Vegetables	4,973	112,037	557,160,001	442,370	2,199,906,010
Okra		1,110		43,300	
Squash		3,492		72,000	
Watermelon				20,000	
Eggplant		17,473		98,130	
Tomato		24,618		47,040	
Mongo		3,130		9,300	
Onion		33,400		126,000	
Asparagus		45		15,000	
Garlic		492		11,600	
Cabbage		2,718			
Soybeans					
Others		25,559			
Roots & Tubers	2,267	42,511	96,372,437	337,720	765,611,240
Ginger		302		97,720	
Cassava		8,583		156,500	
Sweet Potato		21,211		83,500	
Others		12,415			
Banana	3,985	34,096	135,872,560	208,000	828,880,000
Mango	8,141	75,000	610,575,000	309,000	2,515,569,000
Fruits and Nuts	5,875	15,773	92,666,375	474,690	2,788,803,750
Peanut		1,417		79,200	
Papaya		7,111		333,000	
Cashew		86		30,000	
Calamansi		1,691			
Jackfruit		1,188		8,490	
Avocado				24,000	
Others		4,280			
Sugarcane	439	2,178,020	956,150,780	1,860,000	816,540,000
Coffee	19,706	426	8,394,756	13,980	275,489,880
Cacao	16,085	10	160,850	14,925	240,068,625
Coconut	22,442	2,023	45,400,166		
Other Crops			353,000,000		
Total for Crops		4,339,388	10,294,419,979	7,257,860	24,278,118,680
B. LIVESTOCK					
*Cattle, Other L.	940	527,890	496,216,600	1,584,742	1,489,657,480
*Hog	2,534	1,054,830	2,672,939,220	2,556,531	6,478,249,554
*Chicken &Other P.	167	11,768,760	1,965,382,920	42,609,000	7,115,703,000
*Other Poultry	319	1,688,250	538,551,750		
Total for Livestock		15,039,730	5,673,090,490	46,750,273	15,083,610,034
C. FISHERY					
Marine/Inland	22,369	42,549	951,778,581	48,267	1,079,687,878
Aquaculture	33,480	107,707	3,606,030,360	273,514	9,157,243,698
Total for Fisheries			4,557,808,941	321,781	10,236,931,576
D. FORESTRY			19,000,000		
E. SERVICES			873,133,575		2,107,943,062
GRAND TOTAL			21,417,452,985		51,706,603,353

* Volume - No. of Heads
Unit - GVA/Head

Source: JICA Study Team

Table 4.10 Industrial Value-Added Projection by Sub-Sector in Central Luzon and Provincial Breakdown

(in million pesos: 1990 price)

		1990					
GVA 1990	Central Luzon	Bataan	Bulacan	Nueva Ecija	Pampanga	Tarlac	Zambales
311-313 Food & Beverage	7,683	28.0	1,523.5	206.6	5,219.9	614.8	90.3
321 Textiles	426	59.6	360.2	1.1	4.6	0.0	0.0
322 & 324 Wearing Apparel & Footwear	875	397.5	344.7	6.2	76.1	18.1	32.2
323 Leather & Leather Products	176	0.0	175.9	0.0	0.0	0.0	0.0
331 Wood Products	394	5.3	295.4	7.1	83.3	2.1	0.6
332 Furniture & Fixtures	257	0.3	29.3	17.8	194.6	3.1	12.5
341 Paper and Paper Products	560	93.5	466.3	0.0	0.0	0.0	0.0
342 Printing and Publishing	68	1.4	41.0	5.1	9.5	4.4	6.9
351-352 Chemicals & Chemical Products	406	219.4	174.8	0.0	11.0	1.1	0.0
355-356 Rubber & Plastic Products	322	2.9	256.1	3.0	60.1	0.0	0.0
361-369 Non-Metallic Products	1,004	3.4	905.3	23.1	24.0	26.8	20.8
371-372 Basic Metal Industries	89	0.0	86.6	2.2	0.0	0.0	0.0
381,386 Fabricated Metal Products	108	4.6	33.1	11.8	33.2	17.9	7.6
382 General Machinery	95	1.7	47.4	20.9	12.4	8.8	3.6
383 Electrical Machinery & Equipment	774	513.3	260.8	0.0	0.0	0.0	0.0
384 Transportation Equipment	229	73.3	11.9	0.3	0.8	1.0	141.7
390 Other Manufacturing Industries	4,371	3,906.0	142.6	6.9	294.9	14.4	5.8
Sub-total	17,837	5,310.2	5,154.9	312.1	6,024.4	712.5	322.0
Other Industries	8,001						
Construction, Utilities & Mining	10,212						
Total	36,050						

		2010					
GVA 1990	Central Luzon	Bataan	Bulacan	Nueva Ecija	Pampanga	Tarlac	Zambales
311-313 Food & Beverage	32,142	2,031.9	7,505.3	2,696.8	14,911.0	3,487.3	1,509.7
321 Textiles	1,401	172.8	812.5	84.9	202.0	81.5	47.2
322 & 324 Wearing Apparel & Footwear	10,437	2,346.9	2,891.7	861.1	2,646.5	1,009.8	680.4
323 Leather & Leather Products	662	15.5	559.8	22.9	35.0	20.2	8.7
331 Wood Products	724	29.4	448.4	23.2	181.7	25.7	15.6
332 Furniture & Fixtures	2,596	57.7	391.9	217.4	1,695.5	96.4	137.3
341 Paper and Paper Products	1,422	237.3	953.6	36.8	126.8	42.0	25.3
342 Printing and Publishing	175	5.9	98.3	15.6	26.8	12.7	15.8
351-352 Chemicals & Chemical Products	16,377	15,537.7	465.7	46.8	211.1	71.4	44.0
355-356 Rubber & Plastic Products	1,010	85.4	484.3	50.7	277.7	68.4	43.4
361-369 Non-Metallic Products	3,667	230.8	2,156.0	224.2	612.6	268.4	175.3
371-372 Basic Metal Industries	615	36.9	352.3	35.7	125.1	40.1	24.8
381,386 Fabricated Metal Products	1,826	157.0	504.6	240.7	543.6	250.3	129.8
382 General Machinery	733	47.6	266.1	126.0	166.2	85.0	42.3
383 Electrical Machinery & Equipment	31,603	6,718.8	7,509.0	2,946.6	8,785.3	3,535.7	2,107.9
384 Transportation Equipment	1,141	288.2	137.8	48.7	127.3	54.3	484.5
390 Other Manufacturing Industries	11,771	6,356.5	1,750.2	711.1	1,931.1	653.6	367.9
Sub-total	118,302	34,356.3	27,287.5	8,389.2	32,605.3	9,802.8	5,859.9
Other Industries	53,117						
Construction, Utilities & Mining	42,854						
Total	214,273						

Source: JICA Study Team

Table 4.11 Projected Population in 2010 by Municipality and Province and Comparison with 1990 Population

Province/Municipality	1990 Urban	1990 Rural	2010 Urban	2010 Rural
Bataan	317,528	108,275	685,000	114,000
Dinalupihan	58,158	14	140,000	0
Balanga	37,348	14,164	90,000	16,000
Mariveles	46,737	14,024	113,000	15,000
Hermosa	19,952	14,681	48,000	15,000
Morong	4,715	12,440	11,000	12,000
Limay	27,287	5,342	60,000	6,000
Bulacan	1,199,906	305,313	2,445,000	271,000
Malolos	124,634	544	301,000	0
Baliuag	89,622	97	178,000	0
Meycauayan	1,213,816	166	271,000	0
San Miguel	17,978	73,146	48,000	62,000
Norzagaray	18,372	15,113	40,000	13,000
Nueva Ecija	511,549	801,131	1,118,000	800,000
Cabanatuan City	134,694	38,371	325,000	38,371
Palayan City	9,882	10,511	26,000	10,511
San Jose City	30,644	52,192	81,000	52,000
Gapan	42,192	28,297	102,000	28,000
Gabaldon	16,377	5,367	33,000	5,000
Zaragoza	11,549	17,284	25,000	17,000
Guimba	23,173	50,190	61,000	50,190
Cabiao	12,520	36,330	27,000	36,330
Gen. Tinio	17,562	11,929	38,000	11,929
Pampanga	1,079,796	452,818	2,356,000	427,000
San Fernando	156,891	960	416,000	0
Angeles City	236,062	623	569,000	0
Lubao	43,309	56,396	95,000	51,000
Apalit	62,373	0	124,000	0
Mabalacat	110,500	10,615	242,000	9,000
Magalang	18,965	24,975	42,000	22,000
Tarlac	256,594	603,114	596,000	670,000
Tarlac	78,595	130,127	209,000	156,000
Camiling	19,672	43,101	47,000	47,000
Paniqui	16,346	48,603	39,000	53,000
Concepcion	14,683	88,463	35,000	97,000
Capaz	16,238	44,967	39,000	45,000
Victoria	12,743	29,617	31,000	30,000
Zambales	366,690	196,302	832,000	186,000
Olongapo City	192,629	698	465,000	0
Iba	9,769	19,452	26,000	18,000
Sta. Cruz	9,872	31,401	22,000	31,000
Masinloc	14,886	17,489	33,000	16,000
San Felipe	13,497	2,127	27,000	2,000
San Marcelino	22,730	13,868	50,000	12,000
Central Luzon	3,732,063	2,466,953	8,033,000	2,468,000

4.3 Development Phasing for Glocalization

Regional development of Central Luzon along the Glocalization scenario will be realized in steps, as the resources base including financial capacity expands and related institutional development takes place over time. To plan for the regional development accordingly, the planning period up to the year 2010 is divided into three phases: Phase I up to 1998, Phase II for 1999 - 2004, and Phase III for 2005 - 2010. Expected performance of Central Luzon in each phase is described below.

4.3.1 Phase I (up to 1998)

(1) Characterization

To pursue a new paradigm on the balance between economic efficiency, social development and environmental management, Central Luzon will have to be different already at the end of this phase. Among others, people will be re-motivated and better organized, the trend of environmental degradation will have stopped, and the industrial/trade anchors will be well established, equipped with upgraded infrastructure, ready to accommodate strategic industries of the CLDP paradigm. Firm determination and commitment on the part of the Government for the CLDP paradigm, and wide acceptance by the public would be a pre-requisite.

(2) Socio-economy

Agriculture

In addition to the continuation of on-going efforts, new initiative will be necessary in more promising areas identified by the Master Plan. They include mixed farming in the lowland, multi-storey farming in the upland, and integrated farming of various forms in the lowland and upland. These are means to diversify crops without sacrificing dominant rice cultivation. Concentrated efforts will be made to accelerate the agrarian reform for selected agrarian reform communities for crop diversification.

Most essential for these practices will be to disseminate established technology through extension to small farmers. The existing network for extension and applied research linking research institutes with field offices of related government agencies and NGOs will be much strengthened with support facilities. The network will be instrumental also for dissemination of market information.

Also important will be to organize small farmers into more efficient and credible actors for procurement of input and marketing of output as well as production of diversified crops. In particular, an alternative system will be established for new crops in a pilot scale to allow farmers' organizations to own, manage, and operate postharvest facilities.

Rice production will intensify through rehabilitation / restoration of irrigation facilities and promulgation of improved seed. It will also benefit from mixed farming and integrated farming with respect to better soil management and use of organic fertilizer.

Applied research will be geared to the development of alternative systems of production rather than research on individual crops or other production activities. Subjects may include alternative multi-storey cropping schemes (e.g. citrus-based, hedgerow intercropping), cattle breeding/ feeding systems, and agricultural wastes/ by-products utilization systems (e.g. sugarcane-based, rice-based).

Agricultural mechanization will proceed, but the importance of carabao will increase for various purposes including an important component of integrated farming. Other activities to be initiated/ strengthened during this phase include seri-culture, carabao-based dairy, and tissue culture for multiplication of tropical plants.

Industry

A basis for steady growth of industry during this phase will be consumer goods and construction materials industries along with increase in income levels as well as existing handicraft and agro-processing industries. Additional growth will be provided by more footloose industries and various spillover industries from Metro Manila.

The Special Economic and Freeport Zone function will be strengthened by liberalizing it from the customs law and simplifying enterprise accounting with a transaction tax in place of income tax. The Special Economic Zone will be expanded to form a network to meet a wider range of requirements by various industries and to promote linkages among them. A few more exclusive industrial areas will be established to accommodate enterprises of specific countries.

Introduction of support measures to improve products quality will be particularly important during this phase. To support the on-going ISO 9000 accreditation campaign, an accelerated depreciation incentive will be introduced. Regional testing and R & D functions will be expanded targeting at strategic industries in Central Luzon.

Supports to SMEs will be strengthened and systematized. More common service facilities for SMEs will be established, including processing and waste treatment or recycling facilities, showrooms, and welfare facilities for employees. Other services will also be extended such as conduit finance, documentation for export and maintenance services as well as joint procurement and marketing.

Trucking and export services for SMEs will also be established on a cooperative basis. Business cooperatives or industrial associations (IAs) will become more important as

conduits or bodies for subsidy to promote SMEs product development, marketing, training, working environment improvement, public finance and special incentives for taxation.

Services

In addition to steady growth of consumers-oriented services along with income increase, new types of service activities will emerge. They include services to support the industry/trade anchors catering for needs and tasks of visitors/investors from East Asia and their Philippine counterparts, and services related to new agricultural, industrial, and tourism activities. The latter are associated with the establishment of a few services centers such as bus terminal, truck terminal and market post for non-grain products, and the initial development of weekend resorts (both coastal and mountain) and man-made tourism attractions for visitors from Metro Manila.

Non-industrial services to support SMEs will develop such as wholesales that feed back market needs working as a market coordinator, and transport industry that enables small lot consignments. Export services for SMEs will also be established.

Upgraded service facilities will start to be developed within the region. They include international conference and tourism facilities, higher education institutes, research and development, and communication facilities.

(3) Spatial development

Spatial development during this phase will be prescribed to an extent by damages due to the Mt. Pinatubo eruption and continuing lahar threat. More efforts will be directed to restoration of selected existing irrigation schemes, selective rehabilitation/protection of road sections, bridges and rivers, and establishment of resettlement sites with complete support facilities.

In parallel, investments into key infrastructure facilities will support the establishment of the National Triad Growth Centers. They include initial implementation of the highway link between Subic and Clark, the Clark International Aviation Complex with a new passenger terminal, telecommunications and utilities for Subic and Clark, and urban renewal in the Metro Manila spillover areas in Bulacan.

With the provision of upgraded service facilities, functional division among major urban centers will start to be clarified. In anticipation of this, a land use master plan will be prepared for the San Fernando - Angeles Metropolitan area, and urban planning capacity building will be initiated for a few selected urban centers.

(4) Social services for human development

This phase will lay solid foundation for alternative delivery systems for social services based on more active community participation and supports to devolved social services staff. For health in particular, a new community-based health services system will be introduced first in a provincial hospital and other health centers. Also, devolved government hospitals will be improved to serve low income people better.

Improvement in education curricula will be geared up to meet evolving needs of the business sector. Also improved teaching tools such as computers and audio-visual equipment will be more widely used particularly in the science and technology area.

Rapid expansion of day care facilities will be initiated with the participation of local people in planning and construction. Devolved social workers will be re-oriented with training to adapt to new work environment.

Complete support facilities will be provided to all the resettlement areas for Mt. Pinatubo evacuees, including support to organize the resettled people through training of community leaders as well as skills training . Including resettlement areas, renewed focus on the marginalized people/communities will be clarified by the Government.

4.3.2 Phase II (1999 - 2004)

(1) Characterization

This phase will see active transformation of physical and organizational structure in Central Luzon. Physical structure will be characterized by the established National Triad Growth Centers effectively linked to each other by intra-regional artery system. Organizational structure will be characterized by alternative trading and financial systems at the grassroots level managed by organized farmers, and the established networking for extension of rural technology and dissemination of market information.

(2) Socio-economy

Agriculture

New crops and production schemes initiated during Phase I will be expanded to cover larger areas. For some crops, production will reach such levels that will justify the establishment of processing facilities in full scale within the region.

Benefited from the initiative in Phase I, bamboo and rattan plantations will be established, seri-culture expanded, and carabao-based dairy commercialized. Cattle breeding operations will become viable supported by expanded feed base with better use of agricultural wastes and by products, silage production, and managed pasture as well as breed improvement and disease control measures.

Major irrigation schemes will be implemented to enhance rice productivity. Vegetables and other crops will also benefit from supplemental irrigation.

Further crop diversification will be supported by the fully established network linking research institutes and field offices of government agencies and NGOs. Extension and market information will be effectively disseminated through the network.

More postharvest facilities will be owned, managed and operated by organized farmers. Their activities will extend further to joint procurement of agricultural input, and self-financing for investments into land productivity enhancement. In totality, alternative trading and financial systems will be gradually formed.

Industry

This phase is for technological innovation and internationalization. Improved products quality will be the main theme across all the subsectors. Industrial structure will be transformed as more domestic industries are linked with multi-national enterprises in the Special Economic and Freeport Zone.

New agro-industries will establish based on expanded raw materials production. Also resources recycling industries or industries processing agricultural wastes/byproducts will develop supported by BOI incentives.

Handicraft and other traditional industries will be upgraded to become viable economic units. Tourism will provide additional market outlets for their products.

Integrated industrial clusters will start to be formulated through forward and backward linkages centering around strategic industries in Central Luzon. One kind of cluster may be called the total fashion industry and encompasses leather goods, jewelry, garments and metal craft industries. The other kind may be called the total interior design industry and includes leather goods, GTH, furniture, pottery/marble, and metal craft industries.

Services

Non-industrial services will expand their business, including transport, wholesale and export services. The trucking industry will fully establish with network of services and terminals distributed throughout the region.

Weekend resorts and man-made tourism attractions will develop further. Some upgraded facilities will attract international tourists as well, such as a large-scale amusement park, the Balintingon mountain resort, and satellite beach resorts linked with core service facilities at Subic.

(3) Spatial development

Basic infrastructure to support the National Triad Growth Centers will be mostly completed. The Clark International Aviation Complex will become fully operational, the shortest link between Subic and Clark completed, and container facilities at Subic and Clark installed. Initial rehabilitation of the Main Line North will allow passenger services to/from the Clark airport. Waste and wastewater treatment facilities will be initially provided in selected areas within the National Triad Growth Centers.

Links between the 15 urban centers at higher tiers of urban hierarchy will be completed, except the link between Tarlac and Iba. For the latter, existing roads in Tarlac and Zambales will be extended to the respective mountain areas in view also of serving resettlement areas in upland. Inter-regional links will be strengthened with Pangasinan, Aurora and Cagayan Valley. Land use planning for the 15 urban centers will be completed.

The alternative trading and financial systems and the network for extension and marketing information will strengthen service delivery in rural areas. The network will be used also for effective delivery of social services, even in remote rural areas.

(4) Social services for human development

The community-based health services system will be well established during this phase. A cooperative health fund will be established and made accessible by increasing number of people.

Education curricula will continue to be improved with increasing emphasis on developing entrepreneurship or original skills and ability. Value education at the primary and secondary level will, on the one hand, reinstate traditional value, and on the other contribute to creation of new value fitting to open and borderless world. Delivery of various social services will be facilitated by a telecommunication network as well as wider use of audio-visual and other advanced tools.

Resettlement areas will be established as viable barangay communities. Poverty incidence will be reduced to below 10% by the end of this phase. Day care centers will be provided in practically all the barangays.

4.3.3 Phase III (2005-2010)

(1) Characterization

During this phase, better balance will be achieved between agriculture and industry, urban and rural areas, and domestic and international markets for agricultural and manufactured

products. The active and lively rural sector will be the base of social stability, and support industry and service activities in urban areas. The strong private sector will participate actively in the provision of some infrastructure and social services.

(2) Socio-economy

Agriculture

Intensive agricultural land use will be well established under multi-storey farming, mixed farming, integrated farming and rice double cropping. Full utilization of primary products will characterize the agriculture in Central Luzon with recycling, integration and processing of wastes and by products.

Direct export of high value crops from the Clark airport will become common. Products include cut flowers, fresh/chilled vegetables and fruits. Hydroponics and other forms of industrial agriculture will be introduced.

Alternative trading and financial systems based on cooperatives will become dominant facilities to support the majority of farmers. As a result, farmers will become main actors in production and marketing as well as in contract arrangements with large processors.

Industry

Industrial and trade niches will be well established for strategic export industries. Foreign investments will continue to flow in attracted more by amenities and human resources of high quality as well as social and political stability.

The integrated industrial clusters will be established. Central Luzon will enjoy a reputation for high quality products of the total fashion and the total interior design industries. Central Luzon will become a world center for these industries with functions of design-related education, research and life style trend setting.

Continuous technological innovation and skill upgrading will maintain the competitive edge. For this, testing and R & D functions will be expanded, and provincial testing and R & D centers will be established.

Industrial estates will be equipped also with various amenity facilities. Some of them will be practically new towns with housing of various grades.

Services

Central Luzon will establish its fame as an international conference area with first class facilities. Well established beach and mountain resorts will complement this function.

International trade-related services will become common such as offshore banking and international communications. A full range of non-industrial services within the region will support both small and large enterprises.

Rural services delivery will be supported by a local eco-community network. The network will cover not only extension and marketing information but also information related to social services, community activities, and resources and opportunity availability.

(3) Spatial development

The intra-regional artery network will be completed as high grade, multi-modal transport links. All the 38 urban centers at higher tiers of urban hierarchy will be effectively linked. The information highway will be established along the intra-regional arteries, and serve with branch lines the 15 urban centers at highest tiers. Inter-regional links will be strengthened from the 15 urban centers. This will help to integrate economies of the neighbouring provinces with more advanced Central Luzon economies.

Road links will be established for all the rural service centers. Strong hierarchical structure of urban centers will be formed with functional division among them not only to complement different urban centers but also to serve their rural hinterlands collectively.

(4) Social services for human development

With the full establishment of the community-based health services system covering majority of people, self-reliant mind for improving health conditions will prevail among people. Primary preventive health care will be more important, which will incorporate traditional methods and wisdom.

The private sector will become more important in the education system responsive to market demands. Public education institutes will be specialized in advanced concerns on environment, international relationships and laws, human rights including gender and inter-generation issues, and others.

Poverty will be practically eradicated. Communications with various peoples of different backgrounds at different levels and in different fields will provide a wide range of opportunities for further human development.

CHAPTER 5

CHAPTER V DEVELOPMENT PROJECTS, PROGRAMS AND INSTITUTIONAL MEASURES

The Central Luzon regional development to the year 2010 would be supported by a set of projects/programs and related institutional measures constituting the Master Plan as well as other regular programs of various government agencies. Institutional measures by sector are presented in Chapter III. This chapter presents projects, programs and institutional measures related to development planning and administration.

Some projects/programs have been taken from existing plans and programs of sector agencies. Others have been newly formulated through the master planning by cooperative efforts of local communities, NGOs, LGUs and the JICA Study Team. These projects/programs are broadly classified into regional projects/programs, special programs and local projects/programs. Profiles of all the projects/programs are contained in Volume 8: Project Report.

5.1 Regional Projects

Regional projects/programs are further classified into three categories: (1) agri-industrial-trade support, (2) spatial transformation, and (3) community development. Projects/programs in the agri-industrial-trade support category concentrate mostly in the National Triad Growth Centers, but they would support a wide range of activities throughout the region. Projects/programs in the spatial transformation category would support the CLDP spatial strategy to transform the spatial development structure of Central Luzon and overcome inherent land and water related constraints. Projects/programs in the community development category represent more directly the concerns of the CLDP paradigm on social and environmental aspects. All the regional projects and programs are shown in Figure 5.1.

5.1.1 Agri-industrial-trade support

The Subic Bay Metropolitan Authority area and the Clark Field under the Clark Development Corporation are the industrial/trade anchors, that would be effectively utilized for the development of the entire region. These agencies have their own plans to further upgrade the existing facilities. The Master Plan generally endorses the existing plans, makes additional proposals, and clarify priority of implementation.

Subic Metropolitan Area with surroundings

Anchor projects for the Subic Metropolitan Area and its surroundings where the Special Economic Zone may be extended include the following:

(RP-1) Subic Port Development,
(RP-2) Subic Industrial Estate,
(RP-3) Greater Subic Tourism Core Development,
(RP-4) Subic-Looc Jet Foil Connection, and
(RP-5) Hermosa Agro-Industrial Estate.

The Subic Port Development would upgrade port facilities at the former naval base in steps by strengthening container handling facilities. Eventually, it would develop into a hub container port serving the Southeast Asian countries and the main port for Central Luzon and its northern neighbors. The Subic Industrial Estate will be established on a 284 ha land designated for light, high value-added and non-polluting industries. The Greater Subic Tourism Core Development would develop core facilities for tourism in the West Luzon Resort Belt, such as convention and exposition facilities, shopping attractions and various entertainment, linked to satellite resorts in San Antonio, Morong and Bagac. The Subic-Looc Jet Foil Connection would link this core with the CALABARZON tourism core in Nasugbu by provision of passenger piers.

The Hermosa Agro-Industrial Estate (HAIE) will be established on a 116 ha land in Pandatung, Hermosa for light and medium industries such as food processing, GTH, electronics and garments. A Provincial Task Force for the HAIE will take the initiative for implementation with active private sector participation. The International Design Academy (Project No. IN-11) would also support this area as a key institute to realize high image of the Philippines as a world center in broad design industry, if it is established in either the SBMA area or the former Philippine Refugees Processing Center in Morong with satellite telecommunication links to the rest of the world.

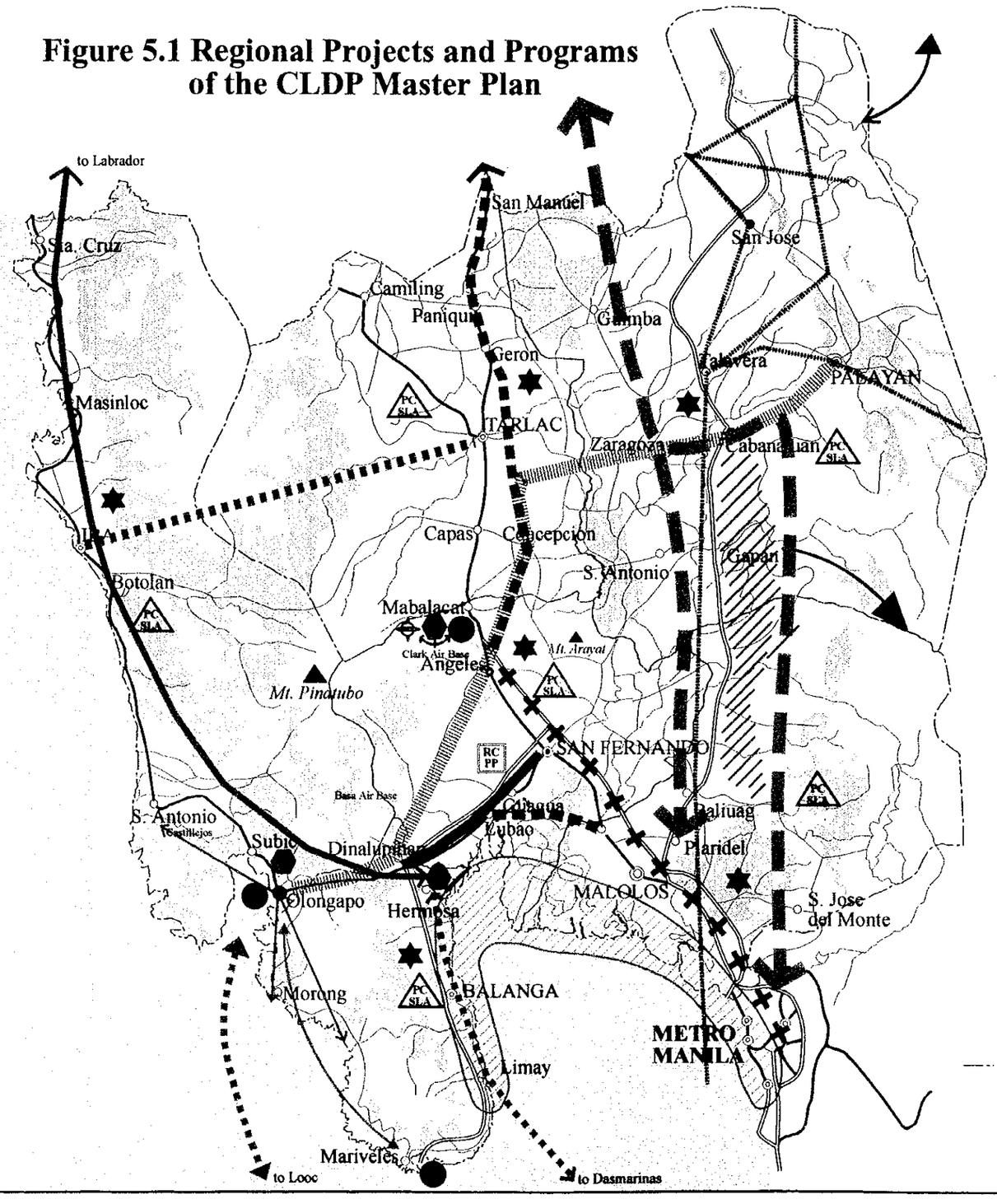
San Fernando-Angeles Metropolitan Area

Anchor projects for the San Fernando-Angeles Metropolitan Area include the following:

(RP-6) Clark International Aviation Complex,
(RP-7) Clark Industrial Estate and Dry Port Development,
(RP-8) Clark Field Amusement Park, and
(RP-9) Main Line North Rehabilitation/Upgrading

The Clark International Aviation Complex would be established initially in 1998 with a new passenger terminal building, and become fully operational during Phase II. The Clark Industrial Estate and Dry Port Development would establish an industrial park of 320 ha with container handling facilities and customs functions.

Figure 5.1 Regional Projects and Programs of the CLDP Master Plan



REGIONAL PROJECTS/PROGRAMS

Agri-Industrial-Trade Support

- (RP- 1) Subic Port Development
- (RP- 2) Subic Industrial Estate
- (RP- 3) Greater Subic Tourism Core Development
- (RP- 4) Subic-Looc Jet Foil Connection
- (RP- 5) Hermosa Agro-Industrial Estate
- (RP- 6) Clark International Aviation Complex
- (RP- 7) Clark Industrial Estate and Dry Port Development
- (RP- 8) Clark Field Amusement Park
- (RP- 9) Main Line North Rehabilitation/upgrading
- (RP-10) BEPZ-SBMA Complemental Development

Spatial Transformation

- (RP-11) New Intra-Regional Artery Establishment
- (RP-12) North Luzon Expressway Extension
- (RP-13) Manila Coastal Road
- (RP-14) San Fernando-Dinalupihan Road Improvement
- (RP-15) Iba-Tarlac Road
- (RP-16) Sierra Madre(Marginal) Highway
- (RP-17) Regional Telephone Service Improvement
- (RP-18) Optic Fiber Network
- (RP-19) Labrador-Hermosa Extra High Voltage Transmission Line
- (RP-20) Hermosa-Dasmarinas Extra High Voltage Transmission Line
- (RP-21) Balintingon Reservoir Multipurpose Development
- (RP-22) Casecnan Multipurpose Development

Community Development

- (RP-23) Holistic Catchment Management Program
- (RP-24) Community-Based Manila Bay and Coastal Rehabilitation and Resorce Management
- (RP-25) Provincial Cooperative Savings and Loan Association
- (RP-26) Agrarian Reform Communities Livelihood and Cooperative Development
- (RP-27) Micro and Small Enterprises Livelihood Systems Development
- (RP-28) Resource Center for People's Participation in Local Governance and Development

LAND USE

Lowland Prime Lands

- Irrigated Paddy
- Rainfed Mixed Farming (Paddy & Vegetables)
- Rainfed Diversified Crops
- Diversified Commercial Crops & Tree Crops

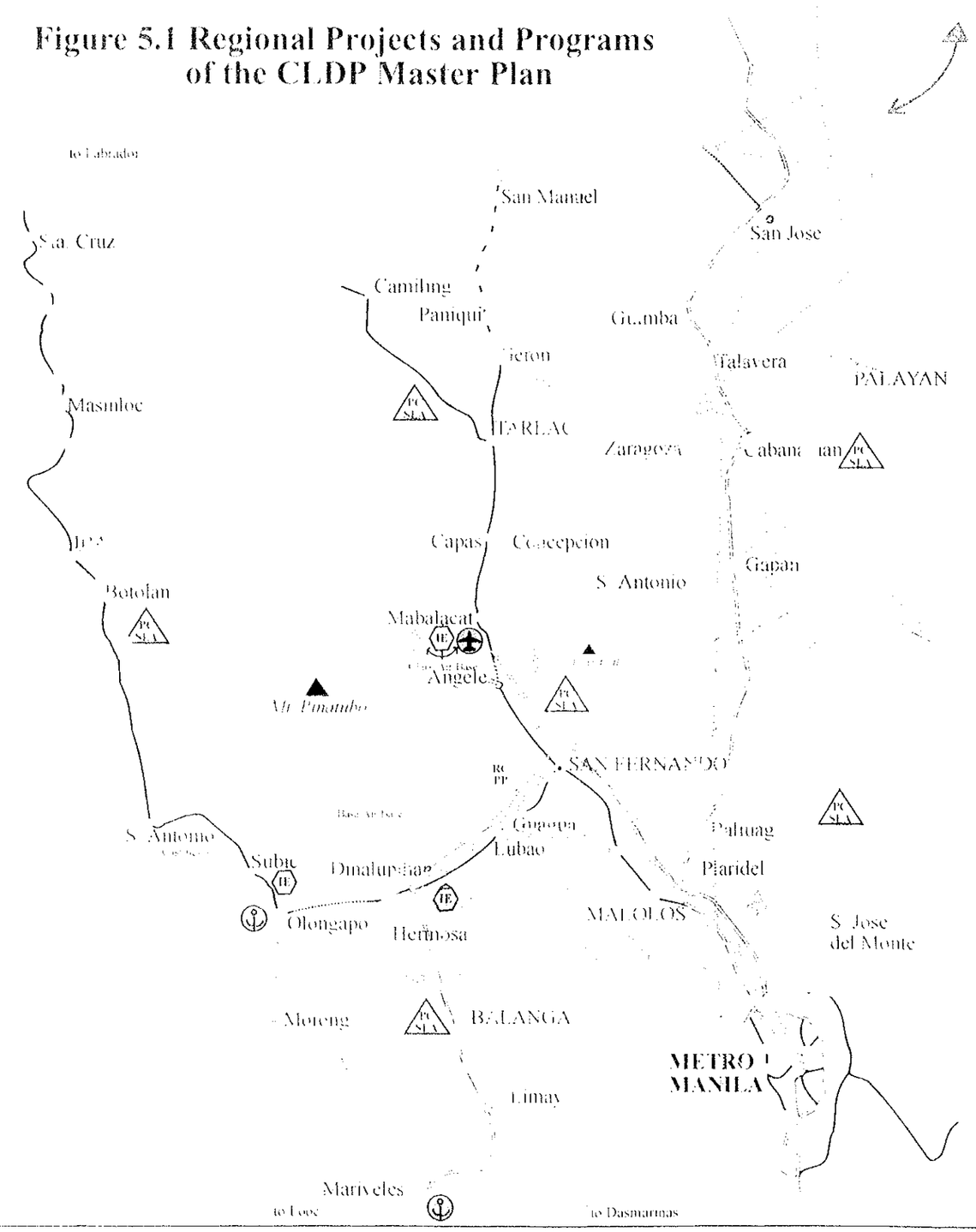
Upland Prime Lands

- Diversified Upland Crops, Tree Crops & Commercial Crops
- Managed Pasture Land also Moderately to Marginally Suitable for Some Commercial Crops & Tree Crops
- Fishing Areas
- Protection Area
- Not Suitable for Agriculture

Production Forest

- Moderately/Marginally Suitable for Tree Crops & Managed Pasture
- Not Suitable for Crop Cultivation
- Miscellaneous

Figure 5.1 Regional Projects and Programs of the CLDP Master Plan



REGIONAL PROJECTS PROGRAMS

Agri-Industrial-Trade Support

Spatial Transformation

Community Development

LAND USE

Lowland Prime Lands

Upland Prime Lands

Production Forest

The Clark Field Amusement Park would create the first large-scale amusement park in the Philippines with all the authentic attractions. This would help to generate new movements of people away from Metro Manila and into Central Luzon.

Key infrastructure facilities would be improved to serve the Metropolitan Area in general and the Clark Field in particular. The Main Line North Rehabilitation/Upgrading would provide rapid and reliable access for air passengers as well as regular services for commuters in Metro Manila, Bulacan, and the San Fernando-Angeles Metropolitan Area. Detailed design would be conducted in Phase I for implementation during Phase II.

The San Fernando-Angeles Metropolitan Area Development (Project No. UR-4) would improved various urban infrastructure facilities within this area. A comprehensive study will be carried out to clarify functional division among the member city/municipalities, allocate key facilities, and prepare land use plans. Specific urban projects to be implemented subsequently would be formulated such as water supply, sewerage, solid waste management, and others (subsection 5.3.3). San Fernando and Angeles City by-passes would be implemented earlier.

Bulacan conurbation

The Metro Manila conurbation area in Bulacan would be supported mainly by the urban sector projects of the Master Plan (subsection 5.3.3). The Urban Renewal and Industrial Modernization Program would be applied first in Phase I to Meycauayan, which is subject to most rapid urbanization and has some polluting industries. Those industries in the already urbanized area would be relocated to areas outside where they would be re-established with upgraded technology and common facilities for waste and wastewater treatment. Areas to be made available by the relocation would be developed for various amenity facilities.

The Integrated Urban Development Program would be applied among others to Malolos. The Urban Land Readjust Program would also be implemented initially for urban municipalities in Bulacan.

Bataan Export Processing Zone

To develop the existing Bataan Export Processing Zone (BEPZ) further and induce more balanced socio-economic development of the Bataan peninsula, links between BEPZ and SBMA may be strengthened. A study should be conducted first under the following program to characterize BEPZ and SBMA in view of locational conditions for industrial development including environmental aspects, and to plan for the phased development of roads (Mariveles - Bagac, Morong - Subic) , Mariveles port and other infrastructure facilities.

(RP-10) BEPZ-SBMA Complementary Development

5.1.2 Spatial transformation

Regional projects in this category consist of those strengthening intra-regional links including roads, telecommunications and power transmission, and multi-purpose water resources development. Both types of projects are important in transforming and strengthening the physical structure of the region, which would support both urban and rural activities.

Roads and highways

Roads and highways to strengthen intra-regional links include the following:

(RP-11) New Intra-Regional Artery Establishment,
(RP-12) North Luzon Expressway Extension,
(RP-13) Manila Coastal Road,
(RP-14) San Fernando-Dinalupihan Road Improvement,
(RP-15) Iba-Tarlac Road, and
(RP-16) Sierra Madre (Marginal) Highway.

The New Intra-Regional Artery Establishment (Rainbow Highway) would be most instrumental in transforming the spatial structure of Central Luzon and changing movement of people and flow of goods away from Metro Manila. It would establish strong links between five provinces (except Bulacan) and four cities (except San Jose City), and contribute to the establishment of a sort of identity of Central Luzon. Initially, it would take advantage of the North Luzon Expressway Extension from Mabalacat, through Concepcion, to the Luisita Estate. Critical sections of the Clark-Subic link may also be improved earlier such as the Carmen bridge over the Gumain river.

The Manila Coastal Road is a long-standing project, and its implementation in its entirety may be looked at as a long-term undertaking. It should be taken as a factor in planning for alternative roads and related development.

The San Fernando-Dinalupihan Road Improvement would be implemented through Phase I - Phase II as a fast track alternative to the expensive Manila Coastal Road. There exist several critical sections on the existing roads. Some are due to elevated river beds and damaged river crossings or damages caused by poor drainage as a result of the lahar. Others are due to heavy local traffic. In addition to the improvement of river crossings, additional lanes should be provided on the upstream side with raised ground and proper drainage.

The Iba-Tarlac Road would connect the only pair of urban centers at higher tiers presently not linked. Viability of this project needs to be enhanced in steps, starting from extension of existing roads in Tarlac and Zambales to support economic activities in the respective mountainous areas and to improve access to resettlement sites in upland. The Sierra Madre

(Marginal) Highway is to establish an alternative inter-regional highway in a long run. Alternative alignments have been proposed. The section in Bulacan and the Mt. Arayat section need a feasibility study at early time.

Telecommunications and power transmission

The following projects of telecommunications and power transmission would strengthen intra-regional links:

(RP-17) Regional Telephone Services Improvement,
(RP-18) Optic Fiber Network,
(RP-19) Labrador-Hermosa Extra High Voltage Transmission Line, and
(RP-20) Hermosa-Dasmariñas Extra High Voltage Transmission Line.

The Regional Telephone Services Improvement would expand the service coverage to six more municipalities in Nueva Ecija, following the master plan recently completed. The main telephone station density would be improved from 1.4 stations per 100 inhabitants at present to 3.8 by 1998. The Optic Fiber Network would be established in a long run, but a master plan study should be conducted in Phase I.

The Labrador-Hermosa Extra High Voltage Transmission Line would be constructed from the end of Phase I through early Phase II. It would allow transmission of power from the coal-fired power plants (2,700 MW) in Pangasinan from the Labrador substation. The Hermosa-Dasmariñas Extra High Voltage Transmission Line would be constructed in Phase II. It would branch off at the Hermosa substation and extend to the Dasmariñas substation in Cavite by a submarine cable crossing Manila Bay.

Multi-purpose water resources development

There exist two large-scale multi-purpose water resources development projects serving large areas in Central Luzon:

(RP-21) Balingtingon Reservoir Multipurpose Project, and
(RP-22) Casecnan Multipurpose Development.

A recent study has established a staged development of the Casecnan Multipurpose Development and the viability of its first stage. However, the optimal operation of the planned system has not been established, and effects of the project on environment and the native people in the upstream of the Cagayan river have not been studied. As the first step, a comprehensive environmental inventory and impact analysis should be conducted, covering not only the natural but also the social environment. A forum should be created with the initiative of concerned local governments based on local communities, relevant NGOs and other experts to oversee this environmental study and further to plan for its implementation.

The Balintingon Reservoir Multipurpose Project would be studied in detail during Phase I for implementation in Phase II. It would allow to irrigate 18,800 ha in portions of seven municipalities in the south of Nueva Ecija, three in Bulacan and one in Pampanga. In addition to paddy, various crops can be introduced to irrigated areas. Hydropower generation would be with two units of 22 MW Francis turbines.

5.1.3 Community development

The following six projects/programs are essential for effecting community-based approach to the Central Luzon regional development:

(RP-23) Holistic Water Catchment Management Program,
(RP-24) Community-Based Manila Bay and Coastal Rehabilitation and Resource Management,
(RP-25) Provincial Cooperatives Savings and Loan Association,
(RP-26) Expanded Agrarian Reform Communities Livelihood and Cooperative Development,
(RP-27) Micro and Small Enterprises Livelihood Systems Development, and
(RP-28) Resource Center for People's Participation in Local Governance and Development.

The first two projects will promote and substantiate the community-based resource management by active participation of local communities and NGOs. The Holistic Water Catchment Management Program will take a river basin approach to comprehensive management of water and land resources. A management body will be formed by critical river basin with the participation of local communities and NGOs in cooperation with LGUs and related government agencies. Water impoundment, soil conservation, reforestation and other measures will be formulated and implemented with local participation. Rattan and bamboo plantations may also be improved (EN-1, EN-2).

The Community-Based Manila Bay and Coastal Rehabilitation and Resources Management will strengthen community-based resource management mechanisms for Manila Bay and its coastal areas, building on the on-going Fishery Sector Program (FSP) and emphasizing some aspects not adequately addressed in the FSP including the community organizing aspects. Establishment of regulatory frameworks for waste and wastewater management as well as control of destructive fishing activities and illegal fishponds by a GO-NGO Manila Bay Environment Task Force is an important part of the program.

The Expanded Provincial Cooperative Savings and Loan Association (PCOSAL) will be a cooperative with quasi-banking operations to be established in each province during Phase I as an alternative rural finance mechanism. Fund sources are savings and time deposits, capital structure, donations and conduit funds form funding agencies entrusted to PCOSAL

by NGOs for safekeeping. In Phase III, a Regional Cooperative Bank will be established with PCOSAL based provincial branches.

The Agrarian Reform Communities Livelihood and Cooperative Development will be instrumental in accelerating the agrarian reform. It can be implemented immediately for established agrarian reform communities (ARCs) to support and revitalize them. At the same time, a comprehensive study will be carried out by a participatory approach to identify additional ARCs with more lands to be allocated and to clarify existing agrarian issues.

The Micro and Small Enterprises Livelihood Systems Development will establish inter-related economic activities in the form of livelihood systems, centering on and supporting entrepreneurial activities in micro or small scale. Each system will encompass production/service activities, trading and marketing, post harvest facilities and other essential infrastructure such as rural water supply, and farm to market roads.

The Resource Center for People's Participation in Local Governance and Development will provide education and training to NGOs and local communities to enable them to participate more meaningfully in the CLDP. Subjects include leadership and management, enterprise development, local governance, negotiation, community development and ecology. The Center will also engage in continuing research on mechanisms for people's participation in the CLDP and social development indicators.

5.2 Special Programs

Special programs focus on three issues characteristic of Central Luzon. These are (1) indigenous people issues, (2) gender concerns, and (3) disaster preparedness and response.

5.2.1 Indigenous people issues

The following two programs address to issues related to Aeta and other indigenous people:

(SP-1) Indigenous People Development Program, and
(SP-2) Indigenous Communities Cooperative Economic Development.

The first program is concerned more with empowerment of indigenous people, while the second program is for supporting their economic activities.

The Indigenous People Development Program will provide a comprehensive package of support measures to empower indigenous people. As the first step, a master plan study will be conducted to clarify existing socio-cultural as well as economic conditions of indigenous people, establish strategy for their development, identify viable livelihood opportunities, and formulate institutional measures to secure their tenureship and enhance their status.

The Indigenous Communities Cooperative Economic Development will support both subsistence activities of indigenous people based on traditional practices and market-oriented activities. For the latter, a multi-purpose cooperative and several trading stations will be established to facilitate the marketing of products produced by the upland people.

5.2.2 Gender concerns

To incorporate gender consciousness into various development initiatives, the following project will be implemented:

(SP-3) Gender Development and Resource Center.

The Gender Development and Resource Center will serve as the central facilities to equip women with necessary skills, training and education. It will offer short and long term courses on various subjects such as production processes and skills, management, and value development, develop curriculum proposals for other formal and non-formal education institutes, and provide services to groups involved in gender and development.

5.2.3 Disaster preparedness and response

One program will establish software for disaster management, and one project will provide hardware for storm and flood forecasting:

(SP-4) Community-Based Disaster Management Program, and
(SP-5) Storm and Flood Monitoring.

The Community-Based Disaster Management Program will maximize the involvement of local communities affected by or vulnerable to disasters to ensure the appropriateness of disaster response measures and make them more effective. It will establish/consolidate people's organizations in disaster-prone areas, formulate and implement disaster management measures, emphasizing the disaster preparedness aspect rather than costly mitigation measures.

The Storm and Flood Monitoring will improve rainfall monitoring and forecasting capacity with the establishment of a radar raingauging system. It will allow timely provision of information on rainstorms, lahar and flooding for people in low-lying areas and reduce the magnitude of disasters.

5.3 Local Projects/Programs

Local projects/programs are classified into three categories depending on the degree of community involvement: (1) community initiative, (2) government initiative with strong

NGO/PO components, and (3) refocused government supports. In pursuit of the CLDP paradigm through the year 2010, increasingly more projects will be implemented on the community initiative.

5.3.1 Community initiatives

The following nine projects/programs have been formulated based on proposals by the NGOs involved in the Master Plan Study. All of them are expected to be initiated during Phase I in respective provinces as designated. Each project/program reflects characteristics of the concerned province, but may be implemented subsequently in other provinces as well. Other projects/programs in the other two categories also have some community involvement in varying degree, and may be implemented on the community initiative in later phases.

(CI-1) Community-Based Upland Development Program (Bataan),
(CI-2) Local Resource and Agri-Based Rural Industries Establishment (Bataan),
(CI-3) Cooperative-Managed Food Terminal (Bulacan),
(CI-4) Cooperative-Based Health Systems Development (Bulacan),
(CI-5) Sustainable Rice-Based Enterprise Development (Nueva Ecija, Pampanga),
(CI-6) Community-Based Integrated and Diversified Farming Promotion (Tarlac),
(CI-7) People's Postharvest and Trading Facilities (Tarlac),
(CI-8) Community-Based Resettlement and Livelihood Development (Zambales), and
(CI-9) Popular Leadership and Entrepreneurship Training (Six provinces).

The Community-Based Upland Development Program aims at the protection, rehabilitation and management of the forest/watershed areas in Bataan through community-based mechanisms. It will provide also sustainable livelihood opportunities to upland people to ease the stress on the forest resources, and improve the delivery of basic social services to them.

The Local Resource and Agri-Based Rural Industries Establishment aims at establishing viable rural enterprises in strategic areas in Bataan based on local resources and agriculture. In particular, fish processing facilities, rice mills, and fruit/vegetable processing facilities will be established, and owned and managed by farmers and fishfolks. Its implementation will start with community organizing and capability building.

The Cooperative-Managed Food Terminal will be created in Bulacan to facilitate storage and physical distribution of agricultural produce from Central Luzon and Northern Luzon. Cooperatives and self-help groups in Bulacan will be organized into a business consortium, and a transport and financial system will be created to support the operation of the food terminal.

The Cooperative-Based Health Systems Development will establish primary health care and service cooperatives as main bodies to promote people's participation and self-reliance for their own health care. Health research, indigenous health care measures, and existing health facilities and services will be integrated into a comprehensive health care system. The integration will lead to the establishment of people's district cooperative hospitals and a cooperative health saving bank.

The Sustainable Rice-Based Enterprise Development Program will provide an integrated package of measures to support rice farmers in Nueva Ecija and Pampanga in the form of sustainable production and marketing system. It will develop the capacity of POs for savings mobilization and credit management, promote sustainable agricultural technologies, establish agri-related rural industries, and create alternative trading and marketing organizations.

The Community-Based Integrated and Diversified Farming Promotion will develop viable diversified/integrated farming schemes for different geographic areas in Tarlac. It will provide for education and training for farmers to adopt new approaches, field application of more viable schemes with technical extension, and information/promotion activities to disseminate new approaches and schemes.

The People's Postharvest and Trading Facilities will put up postharvest facilities owned and managed by a federation of small farmers' cooperatives in Tarlac. Its components are small farmers organizing, consumer/market network building applying the traditional concept of "suki", technology and facilities build-up, and credit.

The Community-Based Resettlement and Livelihood Development will establish a new approach to resettlement and livelihood development applicable to both existing settlements and new resettlement activities. For new resettlement, it will apply the "adopter-adoptee" concept and a "land trust" mechanism. For existing settlements, a participatory approach will be taken for planning and implementation for the provision of additional facilities. The program will be implemented first in Zambales.

The Popular Leadership and Entrepreneurship Training will be implemented for all the six provinces. It will draw from the rich popular education tradition of NGOs which gives emphasis on popular participation and appreciation of indigenous and experiential knowledge. A leadership and enterprise resource center will be established and run by a consortium of NGOs, POs and cooperatives.

5.3.2 Government initiatives with strong NGO/PO components

Additional projects/programs have strong social development components to be supported by NGO/PO participation, although they will be implemented by government initiatives. Five

projects in this category support technological development for agricultural diversification, two projects each are related respectively to livestock and fishery, four others are environmental projects/programs, and one program supports agro-industrial activities particularly in Mt. Pinatubo related resettlement sites.

(1) Agricultural diversification

The following five projects will contribute to crop diversification and agricultural modernization through research, extension and other support services:

(GN-1) Muñoz Agro-Science Community-Quinquepartite Networking,
(GN-2) Tissue Culture Laboratory,
(GN-3) Tropical Plants Multiplication and Distribution,
(GN-4) Farm mechanization, and
(GN-5) Multi-Storey Crop Diversification.

The Muñoz Agro-Science Community-Quinquepartite Networking will be instrumental in diversifying agriculture in Central Luzon supported by advanced technologies. It will establish a quinquepartite network linking academic institutes, national government agencies, LGUs, NGOs and POs for exchange and distribution of information related to land management and agricultural technologies. It will support directly the Tissue Culture Laboratory and the Tropical Plant Multiplication and Distribution, and contribute to the promotion of the Crop-Livestock Integrated Farming, Carabao-Based Dairy, and Aquaculture Integrated Farming.

The Farm Mechanization will support small farmers to increase land productivity through leasing of appropriate farm machinery's and provision of credit for purchase of such. Viable cooperatives will be identified as recipients of these support measures.

The Multi-Storey Crop Diversification will expand systematically the initiative taken by Bataan and Zambales for multi-storey cropping combining coffee, cacao, mango, cashew and other tree crops with vegetables, corn and publses as well as forest trees. A module for each multi-storey cropping scheme will be established, consisting of a central nursery for seedlings of a key tree crop, a nucleus expansion area, organized farmers supported by credit facilities, simple processing facilities, and a research and extension link.

(2) Livestock

The following two projects will promote new types of livestock activities based on applied research:

(GN-6) Crop-Livestock Integrated Farming, and

(GN-7) Carabao-Base Dairy Development.

The Crop-Livestock Integrated Farming will encourage efficient use of livestock/poultry wastes and crop by-products by small farmers for complementary effects of both production activities. Viable schemes for rice-livestock, upland crop-livestock and tree crop-livestock integration will be established by CLSU, and implemented in a pilot scale during Phase I.

The Carabao-Based Dairy Development will establish a breeding station with CLSU for breeding of improved animals. Farmers/carabao owners will be organized for the establishment of a small holder dairy industry.

(3) Fishery

The following two projects will adopt new approaches to fisheries development:

(GN-8) Community Coastal Fisheries Development, and
(GN-9) Aquaculture Integrated Farming.

The Community Coastal Fisheries Development will help to establish more viable fishery communities and promote appropriate and conservation oriented fishing practices by utilizing cooperatives as media to channel various support services to small fishfolks. The program will provide equipment to support self-watch of illegal fishing activities, and training and education on sustainable coastal and marine resources management as well as technical extension for appropriate fishing gear and technologies.

The Aquaculture Integrated Farming will transfer established aquaculture technology to small farmers and encourage integration with livestock/poultry or paddy. It will also allow experiments on cage/pen/pond culture using low cost feed.

(4) Environment

The following four projects will promote environmental conservation, and sound and sustainable tourism activities:

(GN-10) Masinloc-Oyon IPAS Conservation Program,
(GN-11) Tourism Communities Development,
(GN-12) Balintingon Reservoir Resort, and
(GN-13) Localization Initiatives in Forest Protection and Upland Management.

The Masinloc-Oyon IPAS Conservation Program will establish zoning for strict protection, restoration, conservation and tourism facilities areas, monitoring mechanisms, community-based "nipa" farming, and community-based mangrove plantation. The Masinloc Marine